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SOME CORRELATIONS OF ONTOGENY AND PHYLOGENY IN THE BRACHIOPODA.

BY C. E. BEECHER.

The parallelism between the ontogeny and phylogeny in the Brachiopoda has been worked out in numerous instances.[1] To illustrate these, some more or less familiar genera may be taken as characteristic examples.

Lingula has been shown by Hall and Clarke (Pal. N. Y., Vol. VIII, 1892) to have had its inception in the Ordovician. In the ontogeny of both recent and fossil forms, the first shelled stage has a straight hinge line, nearly equal in length to the width of the shell. This stage may be correlated with the more ancient genus *Paterina*, from the lowest Cambrian. Subsequent growth produces a form resembling *Obolella*, a Cambrian and Lower Silurian genus. Then the linguloid type of structure appears at an adolescent period, and is completed at

[1] C. E. Beecher. Development of the Brachiopoda. Part I, Introduction. Am. Jour. Sci., Vol. XLI, April, 1891.

Development of the Brachiopoda. Part II, Classification of the Stages of Growth and Decline. Am. Jour. Sci., Vol. XLIV, August, 1892.

Development of Bilobites. Am. Jour. Sci., Vol. XLII, July, 1891.

Revision of the Families of Loop-bearing Brachiopoda. Trans. Conn. Acad. Sci., Vol. IX, May, 1893.

Deslongchamps e. Etudes critiques sur des Brachiopodes Nouveau ou peu connus, 1884.

Fischer and Œhlert. Brachiopodes: Mission Scientifique du Cap Horn, 1882–1883. Bull. Soc. Hist. Nat. d'Autun, vol. v, 1892.

maturity. Thus, *Lingula* has ontogenetic stages corresponding to (1) *Paterina*, (2) *Obolella*, and (3) *Lingula*, of which the first two occur as adult forms in geological formations older than any known *Lingula*.

Paterina represents the prototype of the Brachiopods. It shows no separate stages of growth in the shell, is found in the oldest fossiliferous rocks, and corresponds to the embryonic shelled condition (protegulum) of the class.

The genus *Orbiculoidea* of the Discinidæ first appears in the Ordovician and continues through the Mesozoic. The early stages in the ontogeny of an individual are, as in *Lingula*, first a *Paterina* stage, followed by an *Obolella* stage. Then, from the mechanical conditions of growth, a *Schizocrania*-like stage follows, and complete growth results in *Orbiculoidea*.

The elongate form of the shell in *Lingula* as well as in many other genera is determined by the length of the pedicle and freedom of motion. The discinoid, or discoid, form of *Orbiculoidea* and *Discinisca* among the Brachiopods, and *Anomia* among Pelecypods, is determined by the horizontal position of the valves, which are attached to an object of support by a more or less flexible, very short organ, a pedicle or byssus, without calcareous cementation. This mode of growth is characteristic of all the discinoid genera, but as already shown, the early stages of Paleozoic *Orbiculoidea* have straight hinge lines and marginal beaks, and in the adult stages of the shell the beaks are usually subcentral and the growth holoperipheral. This adult discinoid form, which originated and was acquired through the conditions of fixation of the animals, has been accelerated in the recent *Discinisca*, so that it appears in a free swimming larval stage. Thus, a character acquired in adolescent and adult stages of Paleozoic species through the mechanical conditions of growth, appears by acceleration in larval stages of later forms before the assumption of the condition of fixation which first produced this character.

The two chief subfamilies of the Terebratellidæ undergo complicated series of metamorphoses in their brachial structure. Generic characters in this family are generally based upon

the form and disposition of the brachia and their supports. The highest genera in one subfamily, which is austral in distribution, pass through stages correlated with the adult structure in the genera *Gwynia, Cistella, Bouchardia, Megerlina, Magas, Magasella,* and *Terebratella,* and reach their final development in *Magellania* and *Neothyris.* The higher genera in another subfamily, boreal in distribution, pass through metamorphoses correlated with the adult structures of *Gwynia, Cistella, Platidia, Ismenia, Mühlfeldtia, Terebratalia,* and *Dallina.* The first two stages in both subfamilies are related in the same manner to *Gwynia* and *Cistella.* The subsequent stages are different except the last two, so that the *Magellania* structure is similar in all respects to the *Dallina* structure, and *Terebratella* is like *Terebratalia.* Therefore, *Magellania* and *Terebratella* are respectively the exact morphological equivalents to, or are in exact parallelism with *Dallina* and *Terebratalia.*

The stages of growth of the genera belonging to the two subfamilies Dallininæ and Magellaniinæ are further correlated in the accompanying tables.

The simplest genus, *Gwynia,* as far as known, passes through no brachial metamorphoses, and has the same structure throughout the adolescent period, up to and including the mature condition. In the ontogeny of *Cistella,* the *gwyniform* stage, through acceleration, has become a larval condition. In *Platidia,* the *cistelliform* structure is accelerated to the immature period, and in *Ismenia* (representing an *ismeniform* type of structure in the higher genera), the *gwyniform* and *cistelliform* stages are larval, and the platidiform represents an adolescent condition. Similar comparisons may be made in the other genera. Progressively through each series, the adult structure of any genus forms the last immature stage of the next higher, until the highest member in its ontogeny represents serially, in its stages of growth, all the adult structures, with the larval and immature stages of the simpler genera. It is evident that in the identification of species belonging to the Terebratellidæ, whether recent or fossil, the strict specific characters

Morphogeny from Gwynia to Dallina.

Periods.	Stages.	Stages.	Stages.	Stages.	Stages.	Stages.	Stages.
Larval	gwyniform?	gwyniform	gwyniform	gwyniform cistelliform	gwyniform cistelliform	gwyniform cistelliform	gwyniform cistelliform
Adolescent	gwyniform	cistelliform	cistelliform	platidiform	platidiform ismeniform	platidiform ismeniform mühlfeldtiform	platidiform ismeniform mühlfeldtiform terebrataliform
Mature	*Gwynia*	*Cistella*	*Platidia*	*Ismenia*	*Mühlfeldtia*	*Terebratalia*	*Dallina*

Morphogeny from Gwynia to Magellania.

Periods.	Stages.	Stages.	Stages.	Stages.	Stages.	Stages.	Stages.	Stages.
Larval	gwyniform?	gwyniform	gwyniform	gwyniform cistelliform	gwyniform cistelliform	gwyniform cistelliform	gwyniform cistelliform	gwyniform cistelliform
Adolescent	gwyniform	cistelliform	cistelliform	bouchardiform	bouchardiform megerliniform	bouchardiform megerliniform magadiform	bouchardiform megerliniform magadiform magaselliform	bouchardiform megerliniform magadiform magaselliform terebratelliform
Mature	*Gwynia*	*Cistella*	*Bouchardia*	*Megerlina*	*Magas*	*Magasella*	*Terebratella*	*Magellania*

must be given first consideration. Species, therefore, must be based upon surface ornaments, form and color, within certain limits, and genera only upon structural features developed through a definite series of changes, the results of which are permanent in individuals evidently fully adult.

In each line of progression in the Terebratellidæ, the acceleration of the period of reproduction, by the influence of environment, threw off genera which did not go through the complete series of metamorphoses, but are otherwise fully adult, and even may show reversional tendencies due to old age; so that nearly every stage passed through by the higher genera has a fixed representative in a lower genus. Moreover, the lower genera are not merely equivalent to, or in exact parallelism with, the early stages of the higher, but they express a permanent type of structure, as far as these genera are concerned, and after reaching maturity do not show a tendency to attain higher phases of development, but thicken the shell and cardinal process, absorb the deltidial plates, and exhibit all the evidences of senility.

Explanation of Plate.

Morphogeny of Magellaniinæ.

The figures in the left hand column, A–H, represent the stages in the ontogeny of the brachial supports in *Magellania*, one of the highest genera of the family Terebratellidæ. In the right hand column are shown the adult, permanent, generic structures, corresponding to the stages of *Magellania*.

Terebratella passes through all the stages from A to G, *Magasella* from A to F, and so on, as far as known for each lower genus.

All figures are drawn of approximately the same length, to facilitate comparison, in consequence the younger stages are much enlarged.

Fig. A.—Early larval brachiopod, without calcified brachial supports, but with circlet of tentacles on lophophore. The *gwyniform* stage.

Fig. A1.—*Gwynia capsula* Jeffreys, a morphic equivalent of larval stage, figure A.

Fig. B.—Later stage of A, showing growth of septum and consequent introversion of edge of lophophore. *Cistelliform* stage.

Fig. B1.—*Cistella neapolitana* Scacchi, showing calcification of loop attached to septum, and other adult features. Morphic equivalent of stage B of *Magellania.*

Fig. C.—Third stage of *Magellania*, with small ring on septum. *Bouchardiform* stage.

Fig. Ca.—Side view of same.

Fig. C1.—*Bouchardia rosea* Mawe, adult, showing ring on septum as in C.

Fig. D.—*Megerliniform* stage of *Magellania.*

Fig. Da.—Side view, showing growth of descending branches as prongs on side of septum.

Fig. D1.—*Megerlina lamarckiana* Davidson, adult form of brachial supports.

Fig. E.—*Magadiform* stage of *Magellania*, showing completion of descending branches.

Fig. E1.—*Magas pumilus* Sowerby, the Cretaceous prototype of this structure.

Fig. F.—*Magaselliform* stage, showing union of descending and ascending branches.

Fig. F1.—*Magasella cumingii* Davidson.

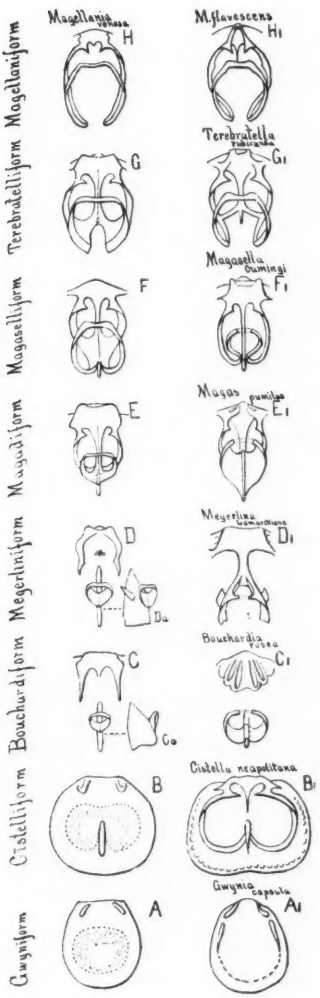
Fig. G.—*Terabratelliform* stage, representing the finished type of structure in *Terebratella dorsata.*

Fig. G1.—*Terebratella rubicunda.* Morphically equivalent to G, but showing more mature features.

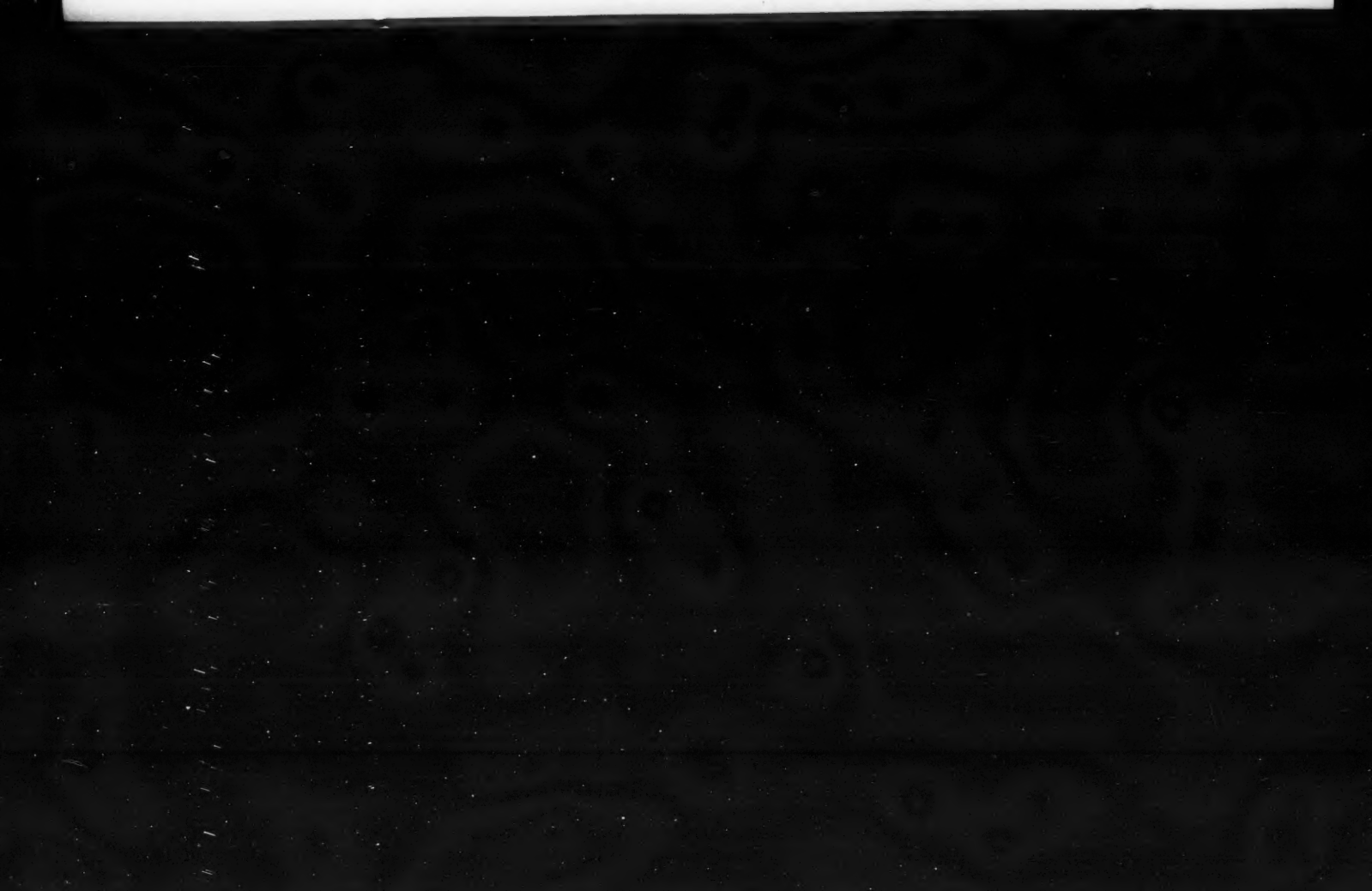
Fig. H.—Final stage of *Magellania venosa*, produced by resorption of the septum and connecting bands of the *terebratelliform* stage.

Fig. H1.—*Magellania flavescens* Lamarck.

PLATE XV.



Parallelism in Brachiopoda, (Magellania series.)



CERTAIN SHELL HEAPS OF THE ST. JOHN'S RIVER, FLORIDA, HITHERTO UNEXPLORED.

By Clarence Bloomfield Moore.

(*Continued from February Number, 1893.*)

(*Third Paper.*)

TICK ISLAND (VOLUSIA COUNTY).

Tick Island can be reached by entering Lake Dexter at its union with the St. John's (see map with the first paper of this series), and continuing across it and along Spring Garden Creek, a distance of about four miles in all, until a landing is reached on the southern side of the creek. The island was entirely unknown in connection with scientific research until visited by the writer in February, March and April, 1891. Other visits were made in January, 1892, January and March, 1893; in all twenty-two days have been devoted to the shell heaps and burial mound on Tick Island, with a large party of assistants; but so interesting is the place, and so extended the remains left by a race now passed from sight that much still awaits a thorough investigation.

In connection with many acres of shell deposit is an interesting burial mound of sand, described by the writer in the American Naturalist, issues of February and July, 1892. Thirty feet south of the great burial mound is a small mound, six feet in height and 180 feet in circumference, composed of fragments of shell mingled with sand, so closely packed that a pick is necessary for the work of excavation. The mound is covered with palmettoes whose roots, closely intertwined, lend an additional difficulty to the work of the explorer. As to the nature of this mound the writer is undecided.

Somewhat over 100 yards distant from the great burial mound in a northeasterly direction is a crescentic, or rather a

bean-shaped, shell heap 573 feet in length, with a maximum breadth of base of 233 feet. The height is somewhat irregular, averaging about eight feet from the surrounding level, though the shell deposit is found sunk deep into the marshy soil. Excavations at various points yielded nothing of interest.

SHELL RIDGES, TICK ISLAND.

About a quarter of a mile south of the bean-shaped shell heap lie acres of shell ridges inadequately investigated by the writer. Upon one of these ridges are the remnants of a live oak, now destroyed by fire, but growing at the time of the writer's first visit and then measured by him. Taken at a point five feet from the base the circumference was sixteen feet or twenty-three feet, three feet from the base over projecting knots. At a distance of twelve feet from the trunk of this tree an excavation, 7 ft. by 4 ft., converging to a depth of 9 ft., was made. After 1 ft. 6 in. of humus, shell was reached. From the start fragments of pottery were found in great abundance, the ornamented outnumbering the plain. It was rude and thick in character, made from clay through which vegetable fibre, destroyed in the process of baking, had left minute canals. To overcome a too porous character, it had been, previous to baking, thinly coated with clay on the outside. The clay contained no admixture of pounded shell or of gravel, which is rarely if ever met with in the shell heaps of the St. John's. The manner of ornamentation mainly consisted of straight lines in various combinations as shown. Many pieces in addition had indentations in connection with lines, as figured by Wyman; while the marking of others consisted of series of concentric circles of increasing size.

At a depth of 7 ft. 6 in.—a depth sufficient to clearly prove its contemporary origin with the shell heap—was found a fragment of ornamented pottery, with a turned lip,[1] the only

[1]By "lip" the writer means a turning out at one point of the upper margin through which fluid may pass, and not a turned rim encircling the pot. Such turned rims are by no means uncommon. It is taken for granted that Professor Wyman meant to express the same idea in the use of the word "lip."

specimen of the sort ever met with by the writer in a shell heap of the St. John's (Fig. 1). Professor Wyman says ("Fresh Water Shell Mounds of the St. John's River, Florida," page, 53): "the mouth of the vase is generally flaring, is seldom contracted; we have seen no instance in which there were signs of a neck, and only one in which there was anything like a turned lip. This was from Bartram's Mound, and was found on the surface where it had been thrown out in digging up an orange tree. The depth of the hole from which it came was such that it must have been superficial, and may have been brought there by the more recent inhabitants. This view is confirmed by the fact that the stamped ornaments were of a different pattern from anything found elsewhere in the mounds, consisting of a series of short parallel ridges instead of squares." Bartram's Mound, or Little Orange Mound, is on the west side of the St. John's, opposite the entrance of Lake Dexter, and is not over five miles distant from Tick Island.

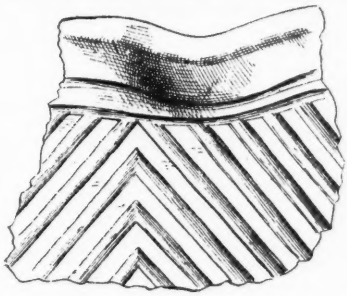
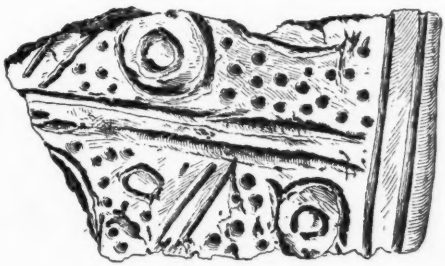


Fig. 1.
Lipped pottery, Tick Island. (Actual size.)

A number of other excavations, some of larger size, yielded



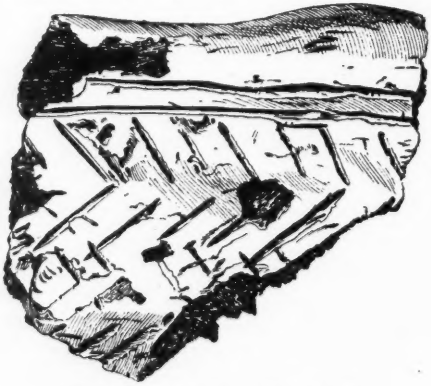
Sherd, Tick Island. (Actual size.)

abundant sherds of like quality and pattern. Tick Island and Orange Mound, to which reference will be made later, are

richer by far in number of sherds and in variety of pattern than any other shell heaps of the St. John's explored by the

Sherd, Tick Island. (½ size.)

writer who, it may be said, has not confined himself to localities hitherto unexplored, but has carefully gone over those previously described by Professor Wyman, and has (January,



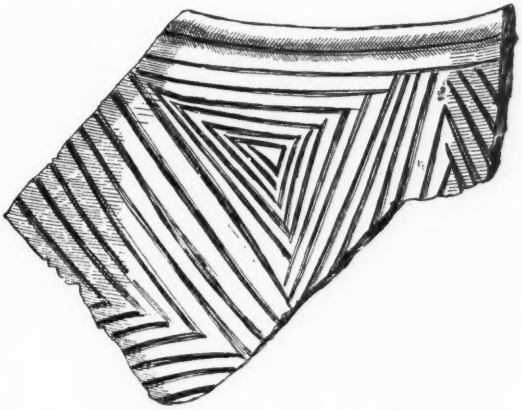
Sherd, Tick Island. (Actual size.)

February, March, April, 1893) extensively explored others previously unreported not included in the list given with the first paper of this series.

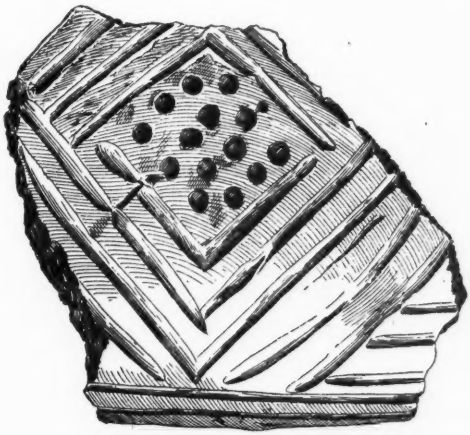
SHELL HEAP NEAR ECONLOCKHATCHEE CREEK (ORANGE COUNTY).

In the prairie about two miles south of Lake Harney, and nearly a mile distant from the west bank of the St. John's, is

a large shell heap covered with palmetto, oak, mulberry and other trees, from many of which hang trailing vines. It



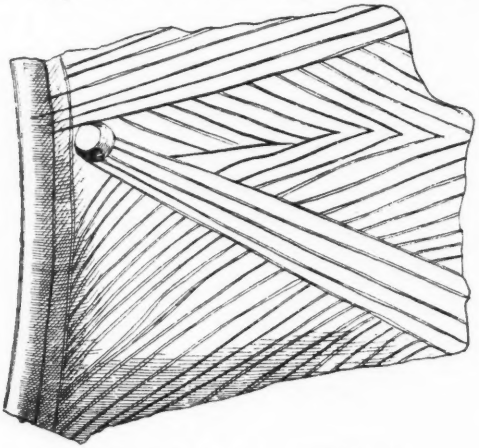
Sherd, Tick Island. (⅜ size.)



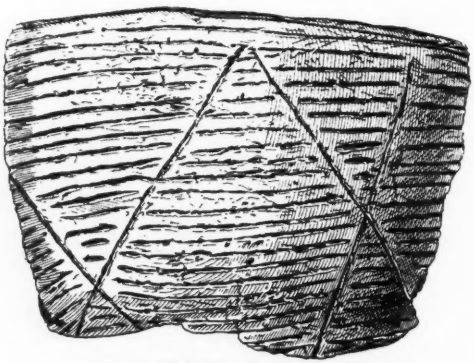
Sherd, Tick Island. (Actual size.)

looms like an island in the prairie which in wet weather becomes a marsh. By ascending the winding Econlock-

hatchee, it is possible to tie up within three hundred yards of the shell heap. Its maximum height is about six feet near



Sherd, Tick Island. (Actual size.)



Sherd, Tick Island. (½ size.)

the center, from which point it slopes in every direction toward the surrounding prairie.

Excavation I.

At the apex of the mound a hole, slightly converging, 6 ft. by 4 ft. by 7 ft. deep, was dug. Beginning at a level one foot

from the surface and continuing through a layer two feet in thickness, were numerous human bones. These bones were broken into fragments and lay at random throughout the entire stratum. Some were found immediately upon a fire-place, and at least one of these human bones showed marks of fire. They were treated in respect to breakage as were the bones of lower animals found with them, and the areas of fracture were of the same dark brown color as the rest of the bone. The bones were so scattered that any estimate as to the number of bodies represented would be impossible, but fragments of at least four crania were met with. Few fragments of bone were in condition for measurement. The average lateral diameter of three portions of tibiæ was 59.9% of the average antero-posterior diameter. As stated in previous papers, these measurements were taken just where the nutrient artery enters the bone. Of three humeri one was perforated.

Composition of the Mound at Point of Excavation.

(*a*) 1 ft.—Sand and powdered shell, containing pottery, plain and ornamented, with fragments of bones of edible animals.

(*b*) 2 ft.—Sand, powdered shell and a slight admixture of shells. Numerous fragments of human bones were found throughout this layer, in association with fragments of animal bones, among which was half the lower jaw of a dog and faeces of animals. At the bottom of this layer, though not covering the entire area, was a fire-place. Absolutely no pottery in this stratum.

(*c*) 1 ft. 6 in.—Ampullariæ, paludinæ and uniones, with slight admixture of sand. No pottery and no bones of animals.

(*d*) 2 ft. 6 in.—Mixture of sand and shell. No remains of any sort.

In the upper layer were found a small piece of chipped chert, a fragment of a rude implement of bone and a rude disc of shell, rough at the margin and perforated in the center, having a diameter of $1\frac{1}{4}$ inches and a thickness of $\frac{1}{4}$ inch.

In the Report of the Bureau of Ethnology, 1880–1881,

Plate XXVII, fig. 2, an almost exact counterpart of this shell disc is given, with the exception that the perforation is larger and irregular. It is described as one of the stages in the manufacture of shell fish-hooks by the Indians of California; but as fish-hooks of any material are not found in the mounds of the St. John's this disc may be considered a discoidal bead.

A second excavation on the east side of the mound showed, as before, pottery in the upper layer and none in those below. Six fragments of bone were met with, of which two were human.

In this shell heap the hypothesis of burials, even of disconnected bones, would seem untenable, as absolutely nothing found in association with them pointed to interments. A portion of the remains of this probably cannibalistic feast can be seen at the Wagner Free Institute, Philadelphia.

The finding of a bone belonging to the dog is entirely novel in the shell heaps of the St. John's. Professor Wyman's searches yielded no canine remains[2] nor has the writer hitherto upon any other occasion found, to the best of his knowledge, any portion of the skeleton of the dog in the river mounds. Wyman was aware of no evidence to show the presence of domestic dogs on the river in early times,[3] and cites Le Moyne's list of animals supposed to have been seen by the French[4] (1565), from which the dog is omitted. On the other hand, Cabeça de Vaca, Treasurer of the expedition of Pamphilo de Narvaez (1527), found dogs[5] among the natives during his wanderings along the coast of northwestern Florida, and in other portions of his journey. He makes no comment as to their origin, as he doubtless would have done had they been pointed out as curiosities, and it is hardly reasonable to suppose that, at so early a period, their derivation can have been from a European source. The bones of dogs are reported from a shell heap at Tampa.[6] The writer learns how-

[2] "Fresh Water Shell Mounds of the St. John's River, Florida," page 80.

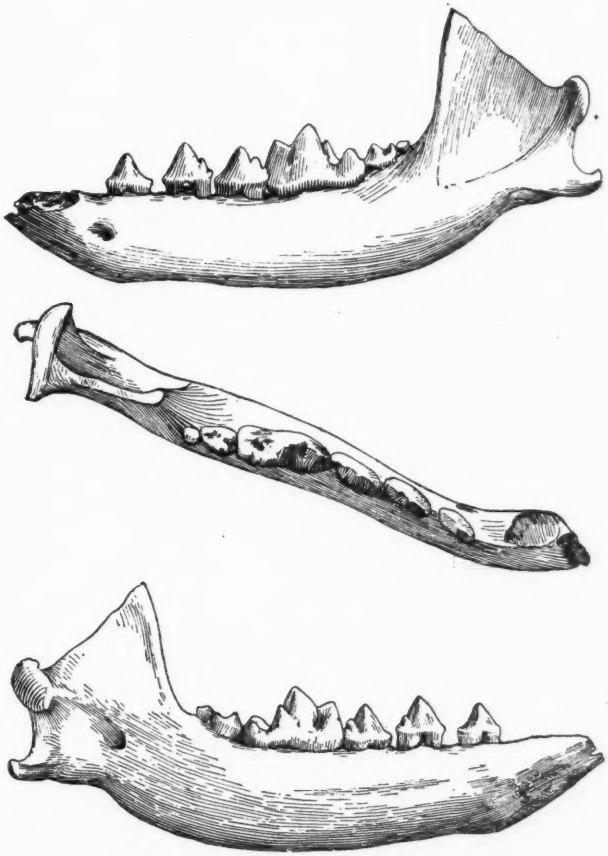
[3] Loc. cit.

[4] Loc. cit.

[5] "The Narrative of Alvar Nunez Cabeça de Vaca," translated by Buckingham Smith, Washington, 1851, page 41, et al.

[6] "Tampa Sunland and Tribune," Nov. 18, 1876.

ever that this discovery was superficial. De Soto, who landed at Tampa, had numerous fierce dogs, and found great quantities of dogs among the Indians of Georgia. Bones supposed to be of the dog are in the stone graves of Tennessee.[7]



Lower jaw of dog from Florida Shell Heap, $\frac{3}{4}$.

Dr. Dall regards it as presumable that the coyote has been domesticated along our southern border from time immemor-

[7] Dr. Joseph Jones, "Antiquities of Tennessee," page 9.

ial, though perhaps as an occasional curiosity in many tribes, rather than a usual companion. During nine years exploration he found one dog's skull in an Aleutian shell heap, a prehistoric deposit, and only one.[8]

The dog has never yet been found fossil in Florida, though the fossil fauna of the state would suggest its presence.[9]

In view of the fact that but a single fragment of a canine skeleton has been found on the river, and that specimen at no great distance from the surface, it may be well, before arriving at any definite conclusion, to await a farther investigation.

Professor Cope has prepared the following note.

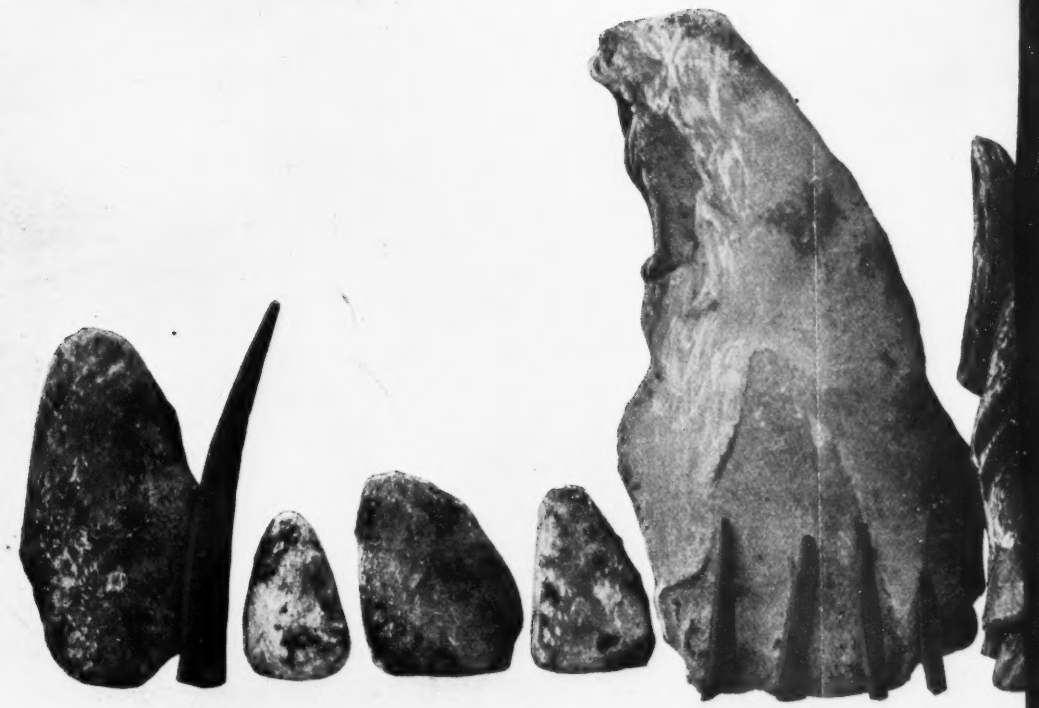
"The lower jaw of the dog found by Mr. Moore presents a number of peculiarities. In the first place, its proportions are not those of either the wolf or coyote. In the next place, the fourth premolar is absent and the short diastema which occupies its place is so much shorter than that which would result were the tooth lost from the jaw of most species and varieties of Canis, that it looks as if the absence were normal to the animal, as in the genus Tomarctus. This tooth is sometimes wanting in some domesticated dogs, but the deficiency occurs in dogs with convex foreheads, which are the product of much civilization. In the third place, the metaconid is larger than in the wolf or coyote, and the domesticated dogs generally. Finally the heel of the sectorial is peculiar. The entoconid is more conic than usual, and such crest as it develops does not form the outer wall of the heel, but is directed more inwardly than usual.

These peculiarities are remarkable, and render it desirable that more specimens should be obtained. The jaw is not referable to any domesticated species or race with which I have compared it. I, however, have not seen the skull and dentition of the Spanish terrier, which, from its appearance, I should suppose to have originated from an African jackal allied to *Canis mesomelas*, and to have been probably introduced into Spain by the Moors. Some of these dogs may have been introduced into Florida by the Spainards.—E. D. COPE."

[8] Dr. W. H. Dall, private letter.

[9] Cope.

PLATE XVI.



Cache, Long Bluff.

PLATE XVI.

Cache, Long Bluff.

ORANGE MOUND (ORANGE COUNTY).

This interesting mound is reached by turning to the west from the river into a lagoon, and continuing about 500 yards after leaving the channel. In a straight line it is ten miles south of Lake Harney, but so devious is the river that three times that number probably would not be an overestimate of the distance by boat, by which means alone can access to the mound be had. Le Baron (Smithsonian Report, 1882, page 102) refers to Orange Mound. He made no investigations and puts the height at forty feet; probably a misprint for fourteen, its maximum altitude. His other dimensions are likewise faulty.

The mound, crescentic in shape, lies north and south. Its length, following the ridge of the crescent, is 560 feet; its maximum width 260 feet. It slopes on every side toward the water and offers usually a secure retreat for numerous large hard-shell turtles which visit it to deposit their eggs. By cutting off their escape to the water, the crew of the writer's boat in one morning secured five, and doubtless the aborigines in the same manner obtained this staple article of diet.

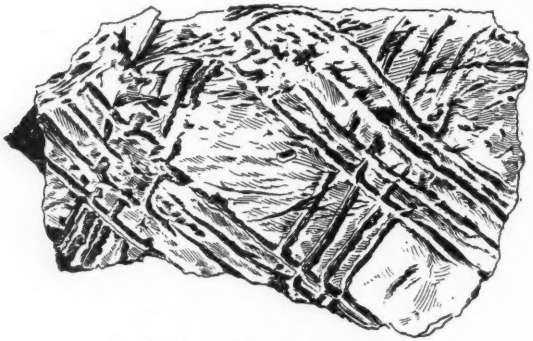
The mound has been under cultivation for the growth of cane, and a tumble-down shed, where once an old caldron stood, is very picturesque, shadowed by towering palmettoes and flanked by a tropical growth of bananas.

Surface pottery is abundant, both plain and stamped in squares. It is of fairly good quality and probably has no connection with the builders of the shell heap. Orange Mound was visited by the writer a number of times during the winter of 1891 and photographs secured; but February 7, 8, 9, 1892 and two days of the winter of 1893 were devoted to serious excavations.

Excavation I.

About the center of the mound at its highest point, 12½ ft. by 8 ft. by 15 ft. deep, converging. The first foot was through a layer of loam filled with pottery of the variety seen on the surface. At a depth of one foot was found a shell chisel,

small and perfect. The next three feet consisted of ampullariæ loosely thrown together, with a slight admixture of sand. Many of these shells were of extraordinary size, among



Sherd, Orange Mound. (Actual size.)

them being found specimens far surpassing all previous records known to science. At a depth of 1½ ft. were clearly defined traces of a fire-place. Through the layer of ampullariæ and in the succeeding stratum, consisting of one foot of brown sand, mingled with ampullariæ, unionidæ and paludinæ, pottery was abundant, thick and coarse in character, with a certain percentage decorated with lines.

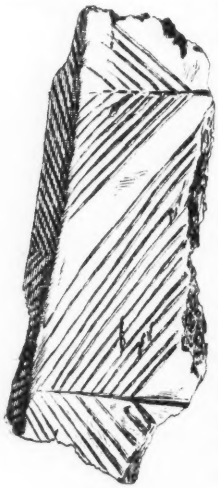


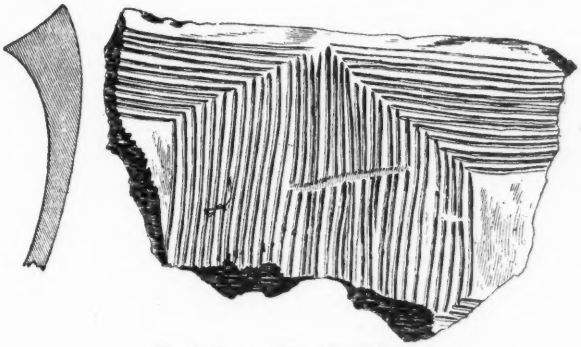
Fig. 2.
Orange Mound. (½ size.)

In its method of manufacture, namely, the admixture with the clay of vegetable fibre, which subsequent heat had destroyed, leaving the material porous in character, it resembled the pottery of the shell ridges at Tick Island and of some other deposits of the river, some sherds being so much as .7 inch in thickness. The patterns varied considerably as to the arrangement of lines, and in certain ones decorations appeared on the upper margin of the rim (Fig. 2).

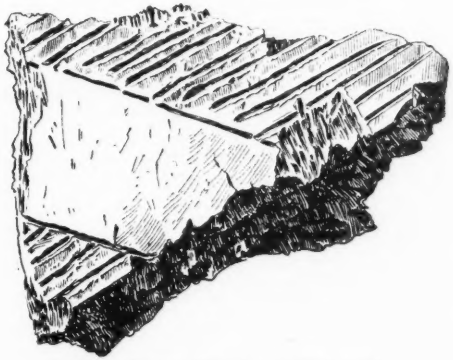
Some fragments with inverted rim were

thickest at the top, the general thickness being .6 inch, thickness of rim 1.2 inches.

At a depth greater than five feet not a fragment of pottery was encountered. Fire-places were found at varying depths, while throughout the entire excavation bones of the turtle,



Sherd, Orange Mound. (½ size.)

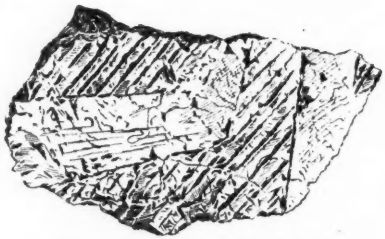


Sherd, Orange Mound. (Actual size.)

deer, alligator and other edible animals were met with. At a depth of 4½ feet, in a layer of brown sand, with a percentage of shell intermingled, strongly reminding the writer of the brown sand layer in the Tick Island burial mound,[10] a num-

[10] AMERICAN NATURALIST, February and July, 1892.

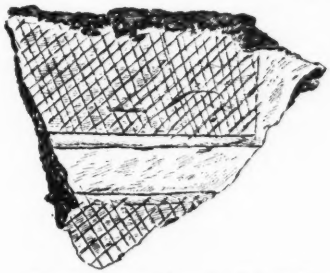
ber of human bones were encountered. They were somewhat disturbed by the digging but were neither crushed nor broken as are the bones of the shell heaps, and it was evident that interments had taken place. Below the bones was a layer of pure white sand, so common in the burial mounds. This stratum seemed to a great extent to be local, being 1½ feet through at the thickest part, namely, the northwest part of the excavation, diminishing on the east and west and being entirely lost on the south. Further investigations showed the white sand layer to decrease in thickness to the north, being but four inches thick at a distance of three feet beyond the excavation.



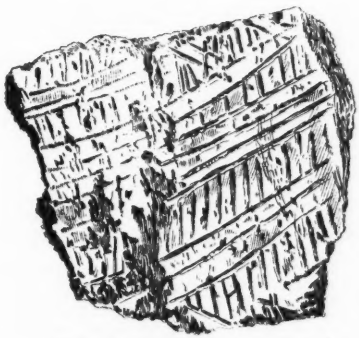
Sherd, Orange Mound. (½ size.)

By digging with trowels into the south side of the excavation, in a layer of almost pure brown sand was found the skeleton of a woman, buried at length in a horizontal position in perfect anatomical order. The skeleton as it lay measured 5 feet, 1½ inches in length. The position of the skull was 10° south of west, the feet pointing 10° north of east. The forearm lay across the pelvis. The body had been buried upon its left side and the left leg and arm were missing. It is almost certain, in view of the presence of every other bone of the skeleton, that these members, extending somewhat from the body, unlike the right arm and leg, were thrown out by the spades prior to troweling into the side of the excavation. The skull was somewhat crushed. The femur was 14½ inches in length (tape); the humerus was not perforated. The tibia in lateral diameter was 58.2% of the fore and aft diameter, showing decided platycnemism.

About one foot south of this burial on a line with the ribs was found what was probably a burial of the kind so well known in some of the sand mounds of the river and of the coast, where the body, previously exposed to the ele-



Sherd, Orange Mound. (½ size.)

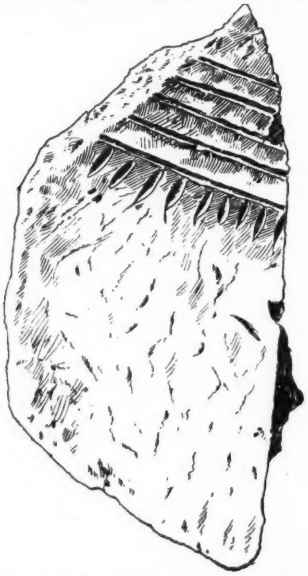


Sherd, Orange Mound. (½ size.)

ments, is denuded of flesh before burial. As a rule, the larger bones are placed in a bundle horizontally and are surmounted by the skull. In this case the cranium lay below the bones. Above it in immediate association were the larger bones of the body. The lower jaw lay about six inches from the upper jaw to one side with the teeth turned away. A few vertebræ were beneath the head, while two heel bones were with the bundle. Upright by the skull was a femur belonging to another body. All these bones were badly decayed

being in a far worse condition than those of the skeleton at length.

To return to the main excavation. Below the layer of white sand were two feet of brown sand and shell intermingled, and beneath this was a stratum 2 feet 9 inches in depth composed of crushed shells with a very slight admixture of sand. At a depth of 8 feet were more human bones disarranged by the digging. At a depth of 8½ feet a cranium was found, with bones of the face missing, except a half of the lower jaw. In



Sherd, Orange Mound. (Actual size.)

association were bones of the lower animals. At the same level as the skull, and where they might be looked for, in anatomical order were pelvis, femur, tibia, fibula and foot bones complete. A femur lay somewhat apart. It is possible that this femur, not in association with the pelvis or with the tibia which was found lying across the first tibia in anatomical order, may have been separated from the skeleton by the shifting of sand caused by trampling in earlier stages of the

mound.[11] Between the skull and pelvis lay decaying fragments of ribs. It is probable that the missing arm bones extending upward were those inadvertently disarranged by digging half a foot above.

At a depth of 8½ feet immediately below the bones was a layer two feet, nine inches in thickness, consisting of the ordinary crushed shell of the shell heaps, with fire-places, bones of the lower animals, etc., as ordinarily found. Nothing of further interest was met with.

Diagram of the northern side of this excavation is appended.

A number of other excavations were made in various portions of the mound. No pottery was met with below 5½ feet anywhere near the center of the mound, though near the margin—probably a later deposit—pieces were found at a depth of seven feet. Eighty-eight feet from the first excavation on the northern slope of the mound seven feet below the surface was found a portion of a rude spear head of red chalcedony, 1½ inches in length. In this excavation the glandina truncata was comparatively numerous, some thirty or fourty specimens being present. This land shell is of infrequent occurrence in the mounds.

Of the four humeri found during the first excavation not one was perforated. The three tibiæ exhumed in a condition for measurement had an average of 58.0 per cent lateral diameter as compared to the antero-posterior diameter. No crania were saved.

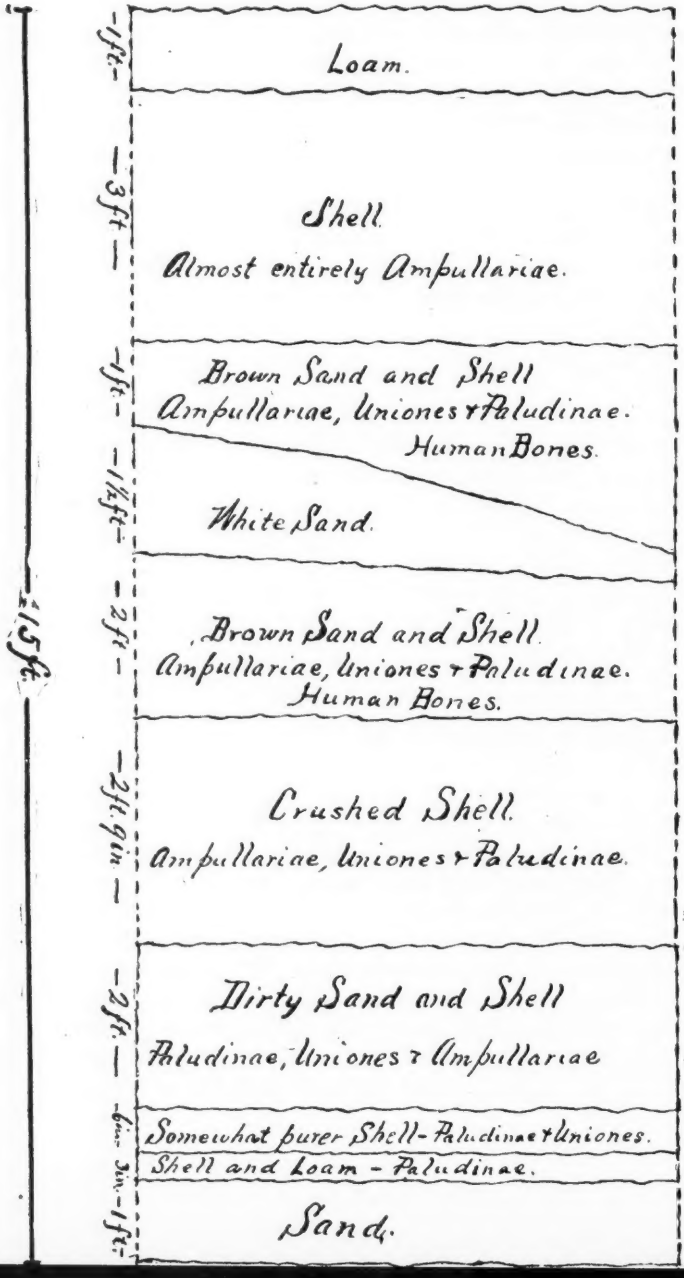
To those interested in the archæology of Florida, the result of the investigation conducted at Orange Mound must be regarded as of considerable importance. It will be remembered that to the present time no conclusive evidence has been secured, assigning to any sand mounds of the river an origin contemporary with the shell-heaps. That burials took place at Orange Mound in a regular stratified mound of sand is beyond the shadow of a doubt, and that the burial mound was not made upon an abandoned shell-heap, perhaps long

[11] This shifting of bones is not uncommon according to Topinard, Revue d'Anthropologie, 1886, page 742.

Section of North Side of Excavation.

Orange Mound, Fla.

Scale- ½" = 1'.



after the eaters of shell-fish had passed away, is irrefutably shown by the three feet of ampullariæ piled above. It must therefore be admitted that the aborigines of the shell heaps, in one instance at least, interred their dead in a sand mound in every respect similar to many burial mounds of the St. John's, and the writer considers it so unlikely that the stratified burial mound met with in the center of the great shell-heap at Orange Mound is an isolated case in respect to the method of sepulture of the eaters of shell-fish that at least the erection of some of the sand mounds of the river by the men who piled up the shell-heaps would seem to be strongly indicated.

LONG BLUFF (ORANGE COUNTY).

This bluff on the west bank of the St. John's lies directly on the water's edge. It is separated from a large shell-hammock by a quarter of a mile of marsh. This southerly portion probably is considered a part of the Bluff, or at all events has no distinctive name. Long Bluff, unlike most of the shell-deposits south of Lake Harney, is not composed entirely of shell and does not appear to owe its origin solely to the debris of the meals of the aborigines, but consists of sand through which is a sprinkling of shells. It is perfectly level and if cleared of the dense mass of palmettoes which shade it, would be termed a shell-field.

A Cache.

About midway in the northern portion of the Bluff an excavation, the point for which was selected at random, was made, 1½ feet through the sandy loam, with here and there an occasional shell. Beneath was a hard conglomerate of sand and shell, mostly uniones, about four inches in thickness, necessitating the use of the pick. Underneath the shell layer was a pure white sand, continuing to water level. At a depth of eight inches in this sand, or 2½ feet beneath the surface, by good fortune, was found what was probably a cache of one of the earlier Indians. In a space no larger than a man's hat,

in actual contact, lay six chisels or scrapers of shell, each of a different size, 8 inches, 4¼ inches, 3 inches, 2¼ inches, 2 inches, 1⅞ inches, in length, respectively; one shell gouge; one spiral instrument for cutting or polishing, 6½ inches in length, made from the columella of the fasciolaria; four bone awls; one curved awl of bone, 4 inches in length; one sandstone hone or whetstone; a large number of the smaller bones of edible animals. (See Plate XVI.)

In order to ascertain whether these relics marked the site of a burial, the excavation was continued until a trench, 15 ft. by 4 ft., 3 in. by 3 ft. to 4 ft. deep, was dug. At a depth of 8 inches from the surface an arrow head was found, and during the course of the digging another hone, an oyster shell and several pieces of lined pottery were met with. There were, however, absolutely no indications of a burial. The chisels were perfect, with one exception, the hone showed no marks of use, and the points of the awls were intact. These relics therefore, are not the debris of the shell heaps, and their number precludes the possibility of an unintentional deposit. With no human bones in association, a cache would seem to be indicated, although the presence of unworked animal bones—unless to serve as material for implements—is difficult to explain.

In the southern portion of the Bluff a number of small excavations were made. Fragments of human bone, with broken bones of edible lower animals were met with.

NOTES ON MARINE LABORATORIES OF EUROPE.

BY BASHFORD DEAN.

In every country the Marine Laboratory has become a need of the student of biology. During his winter studies in the university it serves to provide him with well-preserved material, often with living forms which he may himself prepare according to his wants; in summer it gives him opportunity to see and collect his study types and utilize with profit and without physical discomfort abundant material relating to his studies. To the investigator, the Marine Laboratory has become, in the broadest sense, a university. He may there meet the representative students of far and wide, fellow workers, perhaps, in the very line of his own research, and must himself, unknowingly, teach and learn. He finds out gradually of recent work, of technical methods which often happen most pertinent to his present needs. He may carry on his work quietly and thoroughly; his works of reference are at hand; he has the most necessary comfort in working—the feeling of physical rest, untroubled by the rigid hours of demonstrations and lectures.

The importance of the work of the Marine Laboratory has been keenly appreciated in foreign countries, and it is noteworthy how large a number of the original researches is at present conducted at, or upon material from these distributing centers of biology. At the present day the entire coast line of Europe has become dotted with zoological stations great and small, grown out of the resources granted by societies, private individuals or governments—perhaps by the combined efforts of all. It was a matter of great interest to the present writer during recent visits, to find how thoroughly the Marine Laboratory system abroad had become a part of every grade of biological work. The student in a small university in the interior of France receives his first lessons from material sent regularly from Roscoff or Banyuls—he examines *living* sponges, hydroids, lucernarians, pennatulids, beroës, *Loxosoma, Coma-*

tula and *Amphioxus*. In Munich, hundreds of miles from the sea, is another example. Professor Richard Hertwig, by the aid of material from Naples, demonstrates the larval characters of ascidians, or the fertilization of the egg of the sea urchin. Every group of European universities seems to have centralized its marine biological work in a convenient locality, and this branch of their needs is supported, and is well-supported, even in countries whose financial resources are most limited. The importance of this work is felt to such a degree that it is not from reasons unselfish that universities have united in their support of a station like that of Naples. This has become literally an emporium, cosmopolitan, bringing together side by side, perhaps not unnaturally, the best workers of many universities whose observations upon the best material, sharpened by discussion and criticism, are certainly tending to become the most accurate and the most fruitful in their direction and results.

It is most singular that foreign countries are unquestioningly liberal in the support of *pure* biology, and in the work of marine stations the tendency is becoming less and less on the part of money-givers to ask how many fish will be hatched to become food material. Public interest has been gradually coming to be directed to the general laws and the problems of life and heredity. This has well been a hopeful sign, and the European biologists are not backward in emphasizing the importance of their studies. Professor de Lacaze-Duthiers does not hesitate even to propitiate the practical Cerberus, reminding him how often 'facts have been found at every step of science which were valueless at their discovery, but which, little by little, fell into line and led to applications of the highest importance—how the observation of the tarnishing of silver or the twitching leg of the frog was the origin of photography and telegraphy—how the purely abstract problem of spontaneous generation gave rise to the antiseptics of surgery.'

In the present paper it may prove of interest to examine briefly the condition of a few of the biological stations of Europe.

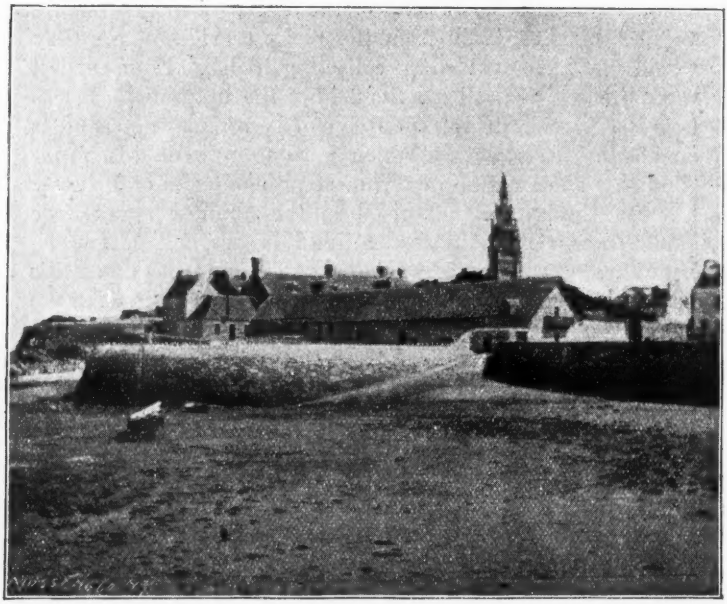
I.—France.

The extended sea-coast has ever been of the greatest aid to the French student—along the entire northern coast the channel is not unlike our Bay of Fundy in the way it sweeps the waters out at the lunar tides. The rocks on the coast of Brittany, massive bowlders, swept and rounded by the rushing waters, will at these times become exposed to a depth as great as 40 feet. This is the harvest-time of the collector; he is enabled to secure the animals of the deep with his own hand, to take them carefully from the rocky crevices where they would ever have avoided the collecting dredge. From earliest times this region has been the field of the naturalist. It was here that Cuvier, during the Reign of Terror, made his studies on marine invertebrates which were to precede his *Règne Animal.* The extreme westernmost promontories of Brittany have, for the last half century, been the summer homes of de Quatrefages, Coste, Audouin, Milne-Edwards and de Lacaze-Duthiers. Coste created a laboratory at Concarneau, but this has come to be devoted to practical fish culture, and is, at the present day, of little scientific interest. It is owing to the exertions of Professor de Lacaze-Duthiers of the Sorbonne, that the two governmental stations of biology have since been founded. The first was established at Roscoff, in one of the most attractive and favorable collecting regions in Brittany, and has continued to grow in importance for the last twenty years. As this station, however, could be serviceable during summer only, it gave rise to a smaller dependency of the Sorbonne in the southernmost part of France, on the Mediterranean, at Banyuls, which had the additional advantage of a Mediterranean fauna.

To these French stations should be added that of Professor Giard, at Wimereaux near Boulogne, in the rich collecting funnel of the Straits of Dover; that of Professor Sabatier at Cette, not far from Banyuls, a dependency of the University of Montpelier; that of Marseilles and the Russian station at Ville-Franche, near the Italian frontier. An interesting station in addition, is that at Arcachon near Bordeaux, founded

by a local scientific society, and having at its command the collecting resources of a small inland sea, famous for its oyster culture. Smaller stations are not wanting, as at the Sables d'Olonne.

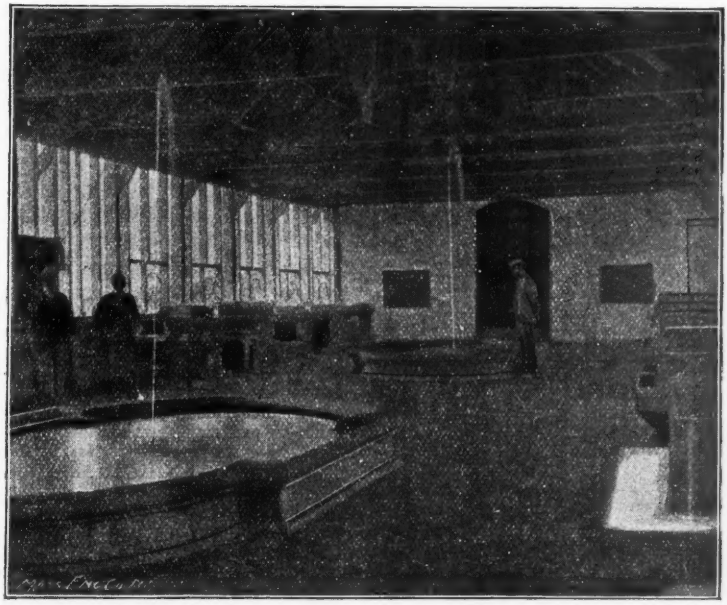
At Roscoff the laboratory building looks directly out upon the channel. In its main room on the ground floor, work places are partitioned off for a dozen investigators; this on the one hand leads to a large glass-walled aquarium room, seen in



FRENCH MARINE STATION AT ROSCOFF, BRITTANY.
(From photograph by author, July, 1891.)

the accompanying figure, while on the other opens directly to adjoining buildings which include lodging quarters, a well-furnished library and a laboratory for elementary students. Surrounding the building is an attractive garden which gives one anything but a just idea of the barrenness of the soil of Brittany. From the sea wall of the laboratory one looks out

over the rocks that are becoming exposed by the receding tide. A strong enclosure of masonry serves as a *vivier* to be used for experiments as well as to retain water for supplying the laboratory. The students are, in the main, those of the Sorbonne, and are under the direction of Dr. Prouho, their *maitre de conférences.* They are given every opportunity to take part in the collecting excursions, frequently made in the laboratory's

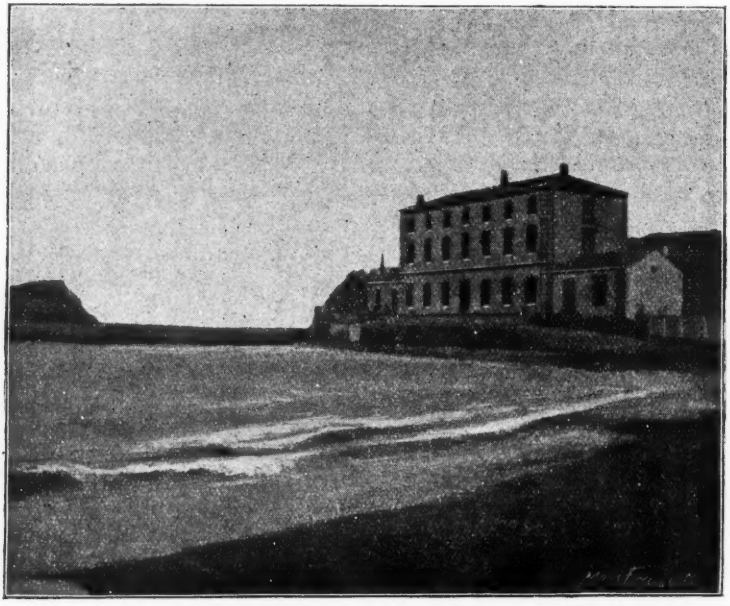


ROSCOFF. INTERIOR OF AQUARIUM ROOM.
(July, 1891.)

small sailing vessels, among the rocky islands of the neighboring coast. Strangers, too, are not infrequent and are generously granted every privilege of the French student. Liberality is one of the characteristic features of Roscoff. The stranger who writes to Professor de Lacaze-Duthiers is accorded a work place which entitles him gratuitously to every privilege of the laboratory—his microscope, his reagents, even his lodging-

room should a place be vacant. It seems, in fact, to be a point of pride with Professor Lacaze that the stranger shall be welcomed to Roscoff, and upon entering the laboratory for the first time, feel as much at home as if he had been there a week. He finds his table in order, his microscope awaiting him, and the material for which he had written displayed in stately array in the glass jars and dishes of his work place. So, too, he may have been assigned one of the large aquaria in the glass aquarium room—massive stone-base stands, aërated by a constant jet of sea water.

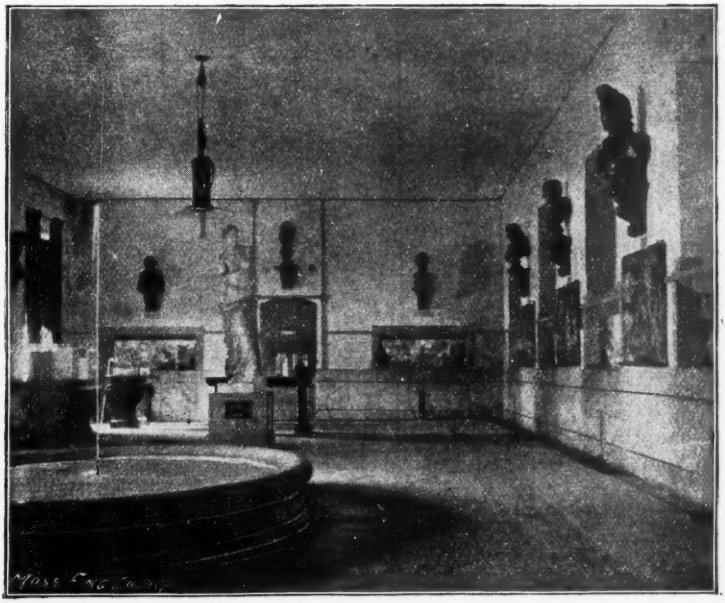
He finds a surprising wealth of material at Roscoff, and his wants are plentifully and promptly supplied.



FRENCH MARINE STATION AT BANYULS-SUR-MER.
(Oct., 1891.)

At Banyuls, the second station of the Sorbonne, the buildings are less imposing than those of Roscoff. It is a plain, three

story building facing the north, at the edge of the promontory which shelters the harbor of Banyuls. The vivier is in front of the station, behind is a reservoir cut in the solid rock—receiving the water of the Mediterranean and distributing it throughout the building. On the first floor is a large aquarium room lighted by electricity, well-supplied with tanks and decorated not a little with statuary donated by the Administration of the Beaux-Arts. The bust of Arago occupies an



BANYULS-SUR-MER. INTERIOR OF AQUARIUM ROOM.
(Oct., 1891.)

important place, as the laboratory has been named in his honor. The suit of a diver, as may be seen in the adjoining figure, indicates at a glance the different tactics in collecting required by the slightly falling tides of the Mediterranean. The wealth of living forms in the aquaria shows at once by variety of bright colors the richness of southern fauna. Sea

lillies are in profusion, and are gathered at the very steps of the laboratory. The work-rooms of the students are on the second floor, equipped in a manner similar to those of Roscoff. The director of this station is Dr. Frédéric Guitel. It is usual during the holidays at fall or winter, for the entire classes of the Sorbonne to spend several days in collecting trips in the neighborhood. The region, with its little port, is famous for its fisheries, and one in especial is that of the Angler, *Lophius*, a fish that would not be regarded as especially dainty on our side of the Atlantic.

The station on the Straits of Dover, at Wimereaux, has earned a European reputation in the work of Professor Giard. It is but a small frame building, scarcely large enough to include the advanced students selected from the Sorbonne. The laboratory is, in a way, a rival of Roscoff, and it is noteworthy that its workers seem to make a point of studying the laboratory methods of the German universities.

The marine laboratory of Arcachon, one of the oldest of France, was built in 1867 by the local scientific society, and was carried on independently until the time of the losses of the Franco-Prussian War. Its management was then fused with that of the faculty of medicine of Bordeaux, with whose assistance, aided by that of a small subsidy from the government, the work of the institution is carried on. Arcachon, in itself, is a most interesting locality near Bordeaux. It has become a summering place, noted for its pine lands and the broad, sandy *plage*, picturesque in summer with swarms of quaintly dressed children, the local head-dress of the peasant mingling with the latest toilets from Paris. Here and there is to be seen that accompaniment of every French watering place, the goat boy in smock and berret, fluting to his dozen charges who walk in a stately way before him. The Bay of Arcachon is a small, tranquil, inland sea, long known for its rich fauna. In large part it is laid out in oyster parks which constitute to no small degree the source of wealth of the entire region. Shallow and warm waters seem to give the marine life the best conditions for growth and development. The laboratory is placed just at the margin of the water. It includes a dozen or

more work places for investigators, well supplied with aquaria, a library on the second floor, a small museum containing collections of local fauna, including numerous relics of Cetaceans that have found their way into this inland sea. A small aquarium room, opened to the public, is well provided with local forms of fishes, and like that of Naples, is eagerly visited. Those who are entitled freely to the use of the work places are instructors in French colleges, members of the Society, and all the advanced students from the colleges of the State. For other students, work place is given upon the payment of a fee whose amount is regulated each year by the trustees. As at Roscoff, material is plentifully supplied.

The Zoological Station at Cette is a direct annex of the University of Montpelier, and it has been gladly learned that the present temporary building is to be replaced by one of stone, which will enable Professor Sabatier to add in no little way to the working facilities of his students. The region, in every essential regard, is similar to that of Banyuls.

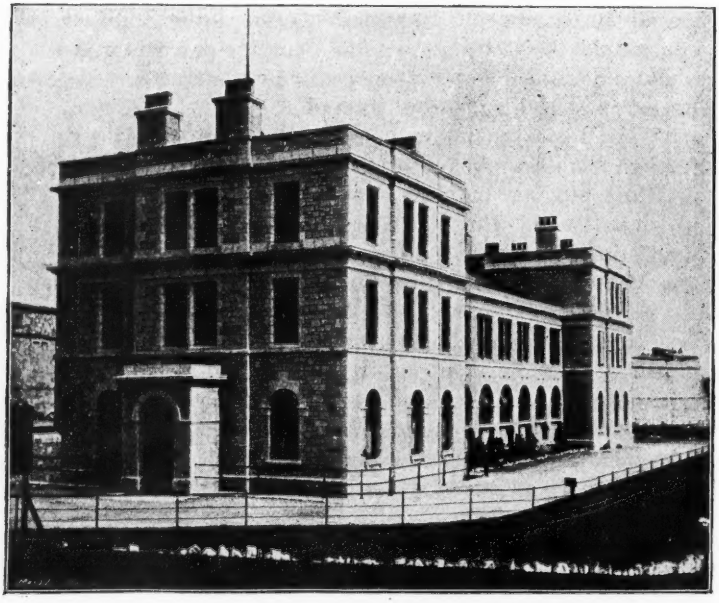
The station at Marseilles is devoted in great part to questions relating to the Mediterranean fisheries, and owes, in a measure, its financial support to this practical work.

The station at Ville Franche is essentially Russian. An account of this with figures has recently been published (Russian text) in Cracow. The station itself is well known through the work of Dr. Bolles Lee, and it is here that Professor Carl Vogt has been a constant visitor.

II.—England.

The laboratory at Plymouth is quite a recent one, first opened in 1888 with a building which is, in many regards, hardly second to Naples. This locality was found well suited for the needs of an extensive marine station. Opposite Brittany it takes advantage of the same extremes of tide, and the rocky Devonshire coast affords one of the richest collecting grounds. The situation of the building is a remarkable one; it stands at one end of the famous Hoe of Plymouth—a broad, level park whose high situation looks far off over the channel. At the rear of the building are the old fortifications of the

town. As shown in the adjoining figure, the building is, at the ends, three storied. On the ground floor is the general aquarium room, well-supplied with local marine fauna, and open to the public. The laboratory proper is upon the second floor, divided into eleven compartments, the work places of the students. A series of small tanks passes down the middle of the room. In the western end are the library,



BRITISH MARINE LABORATORY, PLYMOUTH.
(August, 1892.)

the museum, the chemical, photographic and physiological rooms. In the eastern are the living quarters of the director. The water supply of the laboratory is contained in two small reservoirs directly between the building and the fortifications. Each reservoir contains 50,000 gallons, and the water supply is carried throughout the building by gas engines. Tidal aquaria are in constant use for developmental studies of marine

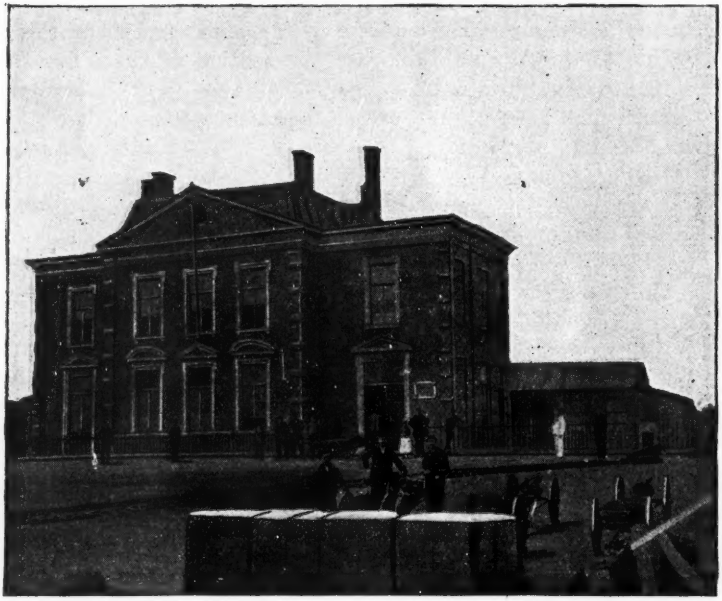
fishes. The collecting for the laboratory is aided by a 38-foot steam launch.

The present support of the station is not, unfortunately, as generous a one as might be desired. The station is obliged to consider in the work of its director matters relating to public fisheries and is only enabled by this means to secure governmental assistance. The building itself was constructed by the efforts of the Marine Biological Association of the United Kingdom, under whose auspices the present work is being carried on. The efficiency of the laboratory is in no little way hampered in its purely scientifie work. The investigators' tables are occupied by any founder of the Association, or his representative, by the naturalist or institutions who have rented them. The subscription price per year of an investigator's place is 40 pounds, but tables may be leased for as short a time as a month. The laboratory provides material for investigation and the ordinary apparatus of the marine laboratory, excluding microscopes and accessories. The use of the larger tanks of the main aquarium is also permitted to the working student. The work of the laboratory includes investigation of fishery matters, the preservation of animals to supply the classes of zoology in the universities and the formation of type collections of the British marine fauna. The naturalist of this station has been, for a number of years, Mr. J. T. Cunningham, whose experiments upon the hatching of the Sole have here been carried on.

Other British marine stations are those of Liverpool and St. Andrews, north-east of Edinburgh. The work of these stations is only in part purely biological; the practical matters of fisheries must be considered to insure financial support. In addition to these there are several stations, notably one south-east of Edinburgh, and another, recently equipped, on the Isle of Man.

At St. Andrews, Professor MacIntosh has studied the questions relating to the hatching and development of the North Sea fishes. Its situation upon the promontory leading into the Firth of Forth seems to have been especially favorable for the study of the North Sea fauna—the locality, moreover, is

far enough northward to include a number of boreal forms. The importance of St. Andrews is at length better recognized, and a substantial grant from the government will enable a large and permanent marine station to be here constructed. The facilities for work have, up to the present time, been



DUTCH ZOOLOGICAL STATION AT THE HELDER.
(Fig. from Tijdschr. d. Ned. Dierk. Vereen, 5 Juli, 1890.)

somewhat primitive—a simple wooden building single storied, has been partitioned off into small rooms, a general laboratory, with work places for half a dozen investigators, a director's room, aquarium and a small out-lying engine house with storage tanks. The laboratory owns a small sail-boat to assist in the work of collecting.

Holland.

Holland, in the summer of 1890, opened its zoological station in the Helder, a locality which, for this purpose, had long

been looked upon with the greatest favor. There is here an old town at the mouth of Zuyder Zee, the naval stronghold of Holland, a station favorable for biological work on account of the rapid running current which renews the waters of the Zee. The station was founded by the support of the Zoological Society of the Netherlands, whose valuable work by the contributions of Hubrecht, Hoek and Horst, has long been known in connection with the development of the oyster industry of Holland. The work of the Society had formerly been carried on by means of a portable zoological station which the investigators caused to be transplanted to different points along the East Schelde, favorable on account of their nearness to the supplies of spawning oysters. The present station at the Helder is situated directly adjoining the great Dyke, a small stone building illustrated in the adjacent figure, two stories, surrounded by a small park. In itself the laboratory is a model one—the rooms are carefully finished and every arrangement has been made to secure working conveniences. A large vestibule leads directly into two laboratory rooms, and by a hallway communicates with the large, well-lighted library, and the rooms of the director. The aquarium room has, for convenience, been placed in a small adjacent building. The director of this station is Professor Hoek, and the President of the Society is Professor Hubrecht. Among others present at the opening of the building may be mentioned, van Bemmelen, Weber, Vosmaer, van Rees, Heinsius, Oudemans and Horst.

EVOLUTION AND DICHROMATISM IN THE GENUS MEGASCOPS.

By E. M. Hasbrouck.

(*Continued from page* 533, *Vol. XXVII.*)

The accompanying tables show the colors of the young produced by parents of known character as to plumage.[1] It will be readily seen that red birds breed either all red, all gray, or both; that reds and grays breed either all red, all gray, or both; while gray birds, as previously stated, invariably breed true.[2] Now to one at all familiar with the theory of reversion to ancestral characters, the perfect harmony between the two theories is self-evident. Take now, the pigeons, which are descended from a parent of bluish color, with certain bars and other markings, and when any breed assumes by simple variation a bluish tint, these bars and other marks invariably reappear; call the two color phases of the common screech-owl species; call the various breeds of pigeons, some of which have bred true for centuries, species; compare these and how exactly parallel are the two cases.

Lastly: the widely accepted theory of the transmission of acquired characters comes to my assistance. Take, for example, the great similarity at certain periods between the plumages of the various ducks, which would indicate that the common ancestor of the duck family was of a dusky color, or, better still, an example of to-day. The young of the genus *Merula* has the breast spotted as in the genus *Turdus*, while that of the adult is plain. Now, one of the grounds upon which this genus is based is, that were the adults spotted, instead of belonging to the genus *Merula*, they would belong

[1] The question mark in the third column signifies that the number of young were not given.

[2] Considerable uncertainty was manifested by some contributors as to what constituted a young, gray bird, they giving the gray down as such, and, while great care has been taken to avoid all such data, it may be well to call attention to possible error.

Table Showing Color of Young Produced by Gray Parents.

NO.	LOCALITY.	NUMBER OF YOUNG.	COLOR.	AUTHORITY.
1	Owego, N. Y.	?	All gray.	J. Alden Loring.
2	Hamilton, Ohio.	?	All gray.	Geo. Harbron.
3	Salineville, Ohio.	4	All gray.	Wm. A. Savage.
4	Sioux City, Ia.	?	All gray.	Dr. Guy C. Rich.
5	Providence, R. I.	5	All gray.	Chas. E. Doe.
6	Racine, Wis.	3	All gray.	Dr. P. R. Hoy.

Table Showing Color of Young Produced by Red Parents.

NO.	LOCALITY.	NUMBER OF YOUNG.	COLOR.	AUTHORITY.
1	Portland, Conn.	5	Red, 3; Gray, 2.	Jno. H. Sage.
2	Lockport, N. Y.	1	All red.	J. L. Davidson.
3	Oakdale, N. C.	?	All red.	Robt. J. Thompson.
4	Odin, Ill.	?	All red.	C. B. Vandycook.
5	Rockford, Ill.	6	Red, 4; Gray, 2.	J. E. Dickenson.
6	Hamilton, O.	?	All red.	Geo. Harbron.
7	Grinnell, Iowa.	?	All gray.	Lynds Jones.
8	Grinnell, Iowa.	?	All gray.	Lynds Jones.
9	Argentine, Kansas.	3	Red, 2; Gray, 1.	Geo. E. Stilwell.
10	Bell, Ky.	6	"Part red, Part gray."	Carrington C. Bacon.
11	Providence, R. I.	2	Red, 1; Gray, 1.	H. A. Cash.
12	Beaufort, S. C.	?	Gray, 2; Rest red.	Walter Hoxie.
13	Beaufort, S. C.	?	Red, 1; Rest gray.	Walter Hoxie.
14	Washington, D. C.	3	All red.	C. W. Richmond.
15	Cambridge, Mass.	3	All red.	Wm. Brewster.
16	Madison, Wis.	4	All red.	Chas. F. Carr.
17	Racine, Wis.	4	All red.	Dr. P. R. Hoy.
18	Jefferson, Wis.	5	Red, 3; Gray, 1; Intermediate, 1.	Ludwig Kumlien.
19	Charlestown, W. Va.	5	Red, 4; Gray, 1.	B. W. Mitchell.

Table Showing Color of Young of Gray and Red Parents.

NO.	LOCALITY.	NUMBER OF YOUNG.	COLOR.	AUTHORITY.
1	Astoria, L. I.	4	All red.	Franklin Bennet.
2	Toronto, Canada.	5	Red, 2; Gray, 3.	James R. Thurston.
3	Argentine, Kansas.	3	Red, 2; Gray, 1.	G. E. Stilwell.
4	Argentine, Kansas.	2	Both red.	G. E. Stilwell.
5	Manhattan, Kansas.	3	All red.	D. E. Lantz.
6	Versailles, Ky.	?	All gray.	L. O. Pindar.
7	Attleborough, Mass.	4	All gray.	H. A. Cash.
8	Cambridge, Mass.	4	All red.	Wm. Brewster.
9	Giddings, Texas.	?	All gray (*mccallii ?*).	J. A. Singley.
10	Strafford, Vt.	?	Red, 2; Remainder gray.	Chas. P. Collins.
11	Fayette, Mo.	4	Gray, 2 (2 died).	J. W. Kilpatrick.
12	Jefferson, Mo.	4	Red, 2; Gray, 2.	Ludwig Kumlein.

to *Turdus;* it being claimed that *Merula* has been evolved from and is one plain above *Turdus,* and that the spotted breast of the young robin is a transitory inheritance of the acquired markings of the rest of the thrush family. If this be so, then, as all screech-owls are gray in the down, from which those destined to be red, *afterwards* acquire their plumage at the first moult; does it not follow that the aboriginal bird was gray, whose prominent and characteristic markings are reproduced in every brood of young? While on the other hand, if the down of young birds were *red,* from which the gray birds appeared after the moult, the whole theory would be overturned, but it is hardly necessary to state that this is not the case; and the fact that gray birds are extremely rare in some regions, and wholly wanting in others, seems conclusive proof that the gray form is gradually becoming extinct over certain areas.

He who believes that each variety of pigeon known to fanciers has been independently created, and that the various color phases exhibited by individuals of the same species are without meaning and without purpose, will probably assert that each species has been created with a tendency to vary both under nature and under domestication, each in its own particular manner, so as often to become marked like other species of the same genus, and that a species has been created with a strong tendency to produce young not the color of their parents, but other forms closely connected. To admit this view seems, as Darwin aptly says, "To reject a real for an unreal, or at least for an unknown cause. It makes the works of God a mere mockery and deception," and "I would almost as soon believe with the old and ignorant cosmogonists that fossil shells had never lived, but had been created in stone so as to mock the shells living on the seashore." While, on the the other hand, both geology and palæontology plainly proclaim that old forms have been supplanted by new and improved forms of life, the product of "variation" and the survival of the fittest.

Part II.

CAUSES AND INFLUENCES.

The close relationship existing between various branches of science, is, perhaps, nowhere more clearly shown than in the present field of research. Four distinct causes have been found appearing to influence the condition of the screech owls, each of which has an evident bearing upon the other, and the whole forms such a chain of evidence that its truth can hardly fail to be apparent.

These causes or influences are—

1. Humidity.
2. Temperature.
3. Acquired characters.
4. Forest areas.

These will be treated separately under their respective headings and in the order given, while a careful examination of the maps will show their bearing upon the distribution of the color phases of the screech-owl.

A.—Influence of Humidity.

It has been conclusively shown by Allen[3] that humidity is one of the main influences governing the local variations of color in individuals of the same species, and that the distribution of the light colored races is strictly coincident with the regions of mean minimum rainfall, while the dark forms are confined mainly to regions of mean maximum rainfall. Naturally enough, its effect is greatest during the breeding season, and with the present species the months of March, April, May and June may be considered as the period during which the young would be most under its influence; accordingly, map 3 has been constructed upon the mean of the data for these four months.

The shaded area designates that region where the mean humidity is 70 and over, while localities having less are unshaded. Now it will be seen that to a very great extent the grays are confined to those areas where the humidity is the

[3] Bull. Mus. Comp. Zool. II, 1871, 240-241.

greatest, while on the other hand the reds are distributed over the less favored parts of the country. Along the Atlantic and Gulf coasts, this humid belt corresponds very closely with the pine belt on map No. 5 (although narrower on the Atlantic slope). Here the distribution of the color phases fails to correspond with either the pine or the humid belt, although it does so perfectly with the temperature zones (see map No. 4), while in the northern part of the United States and in Canada the similarity is very great. Unfortunately, no data exist for the little strip extending down the Alleghanies, but as mountanious regions are, as a rule, exceedingly humid, particularly when heavily wooded, there is little doubt but that when data is collected for this region, it will show a narrow strip reaching from New York State to the neighborhood of eastern Kentucky, when the similarity between color distribution, humidity, temperature and forest areas will be nearly complete.

The whole subject of dichromatism as regards *Megascops*, may be considered a special case of the general subject of darker colored species inhabiting humid areas. The red form can be assumed to be a more highly colored form of the gray, and the same is true of *Megascops* as a whole in which the various subspecies — *floridanus, mccallii, kennicottii, bendirei, maxwelliæ* and *trichopsis*—are representative of the dark and light forms respectively of the humid and arid regions, and in *Megascops asio* proper, the gray may be taken as the form inhabiting humid areas, while the red phase represents the lighter colored forms of the drier region.

B.—Influence of Temperature.

According to Verrill and Allen,[4] the most potent of all influences in the distribution of color is temperature, which, in the case of birds, is greatest during the breeding season, and as in the case of humidity, map No. 4 is based upon the data for the months previously mentioned. Now, by reference to map No. 4, it will be seen that there are three belts or zones of temperature corresponding to the distribution of the red and gray phases of the screech-owl—the one reaching from Charleston, S. C., to

[4]N. A. Fauna, No. 3, p. 26.

central Texas having a mean temperature of 65° Fahrenheit and upward for the months mentioned; another on the north, extending from New Brunswick to Central Dakota, 45° Fahrenheit and *less*, marking the distribution of the gray form, while the intermediate territory lying between the isotherms of 45° and 65° covers nearly the entire area inhabited by the reds. Just *how* this influence is exerted it is, of course, impossible to say, but that there is an apparent relation is evident from a comparison of maps 2 and 4, while maps 2, 3, 4 and 5 show that on the northern and southern borders all influences combine to produce the existing conditions.

In comparing the northern belt, where a *minimum* degree of temperature exists coincident with the gray phase with the southern, where a *maximum* degree is found also coincident with the same phase, the question arises—Why, in one portion of the country, is a low temperature and in another a higher temperature conducive to a given phase? and the problem is a knotty one. Future investigations may show that some cause or causes, still unknown, exist along the Atlantic coast, but the probabilities are that humidity is the dominant factor in the subject under discussion.

C.—Influence of Acquired Characters.

In attempting to ascertain the causes influencing the condition of *Megascops*, one of the foremost things to be considered is the peculiar distribution of sex as regards color. Leaving the intermediates out of the discussion, as being an evident attempt on the part of nature to fashion a form midway between the two color phases, it will be best to consider only the gray and red.

Out of the total of 3600 birds which furnished data for this paper, 646, scattered over the entire territory, show the following relation of color to sex. It will be seen that the number of gray males far outnumber the red males, while the number of red females outnumber the gray females four to one. This is scarcely a fair average for the whole, as it must be borne in mind that the numbers cover *all* of the territory inhabited by the three forms—*asio, floridanus* and *mccallii*—and conse-

Table Showing Relation of Color to Sex.

(Based on 646 birds scattered over entire area.)

Gray.		Red.	
Male.	Female.	Male.	Female.
183	73	93	297

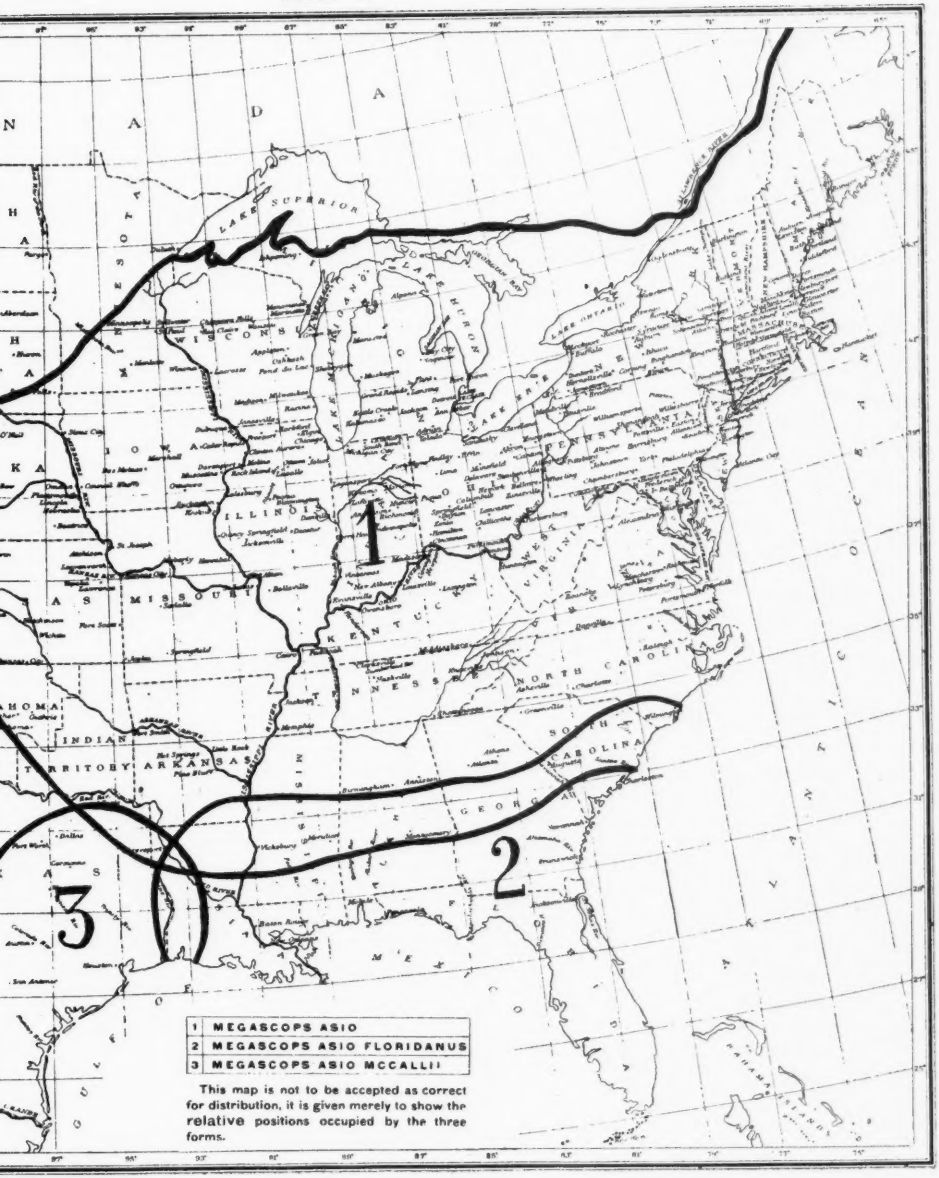
quently include the figures from those localities where the red and gray respectively are the only forms known. Now it will be seen that the red birds are much more numerous than the grays—the total number being 390 as against 256 of the gray, and if the influence of the exclusive red and gray regions on this average be considered, the proportion for the mixed areas will be somewhat increased. As a consequence, in that region shown on map 2, where red and gray birds are intermingled, with red in the majority, the reason is at once apparent why red and gray birds, or two red birds, are so often found mated, and so seldom a pair of grays.

Granting now that the red birds are most numerous, does it not follow that the fewer the grays in any given region, and therefore the farther removed each generation of red birds from the parent stock, *in just such ratio will the tendency to revert to ancestral characters decrease?* It has been shown by Darwin[5] that in the struggle for existence, only those forms survive that are best fitted for the existing conditions of life to which they may be exposed, and, as a result, forms unfitted leave few progeny, and eventually become extinct. It will be shown farther on why the gray form is not fitted for those regions in which the red is now so greatly in the majority; accordingly, it becomes evident that where the red males and females already so greatly outnumber the gray, it requires but an indefinite lapse of time for the existence of the latter form to be forever terminated in certain sections.

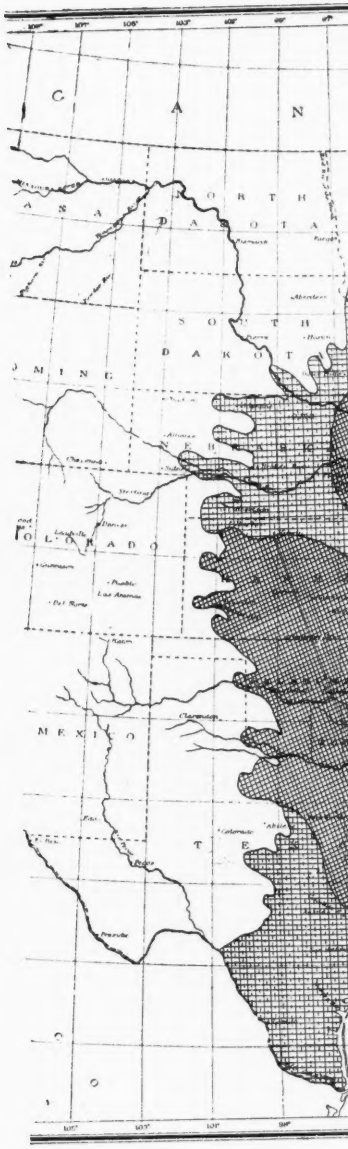
[5] Origin of Species, 69.


C A N
NORTH
DAKOTA
SOUTH
DAKOTA
NEBRASKA
KANSAS
OKLAHOMA
TEXAS

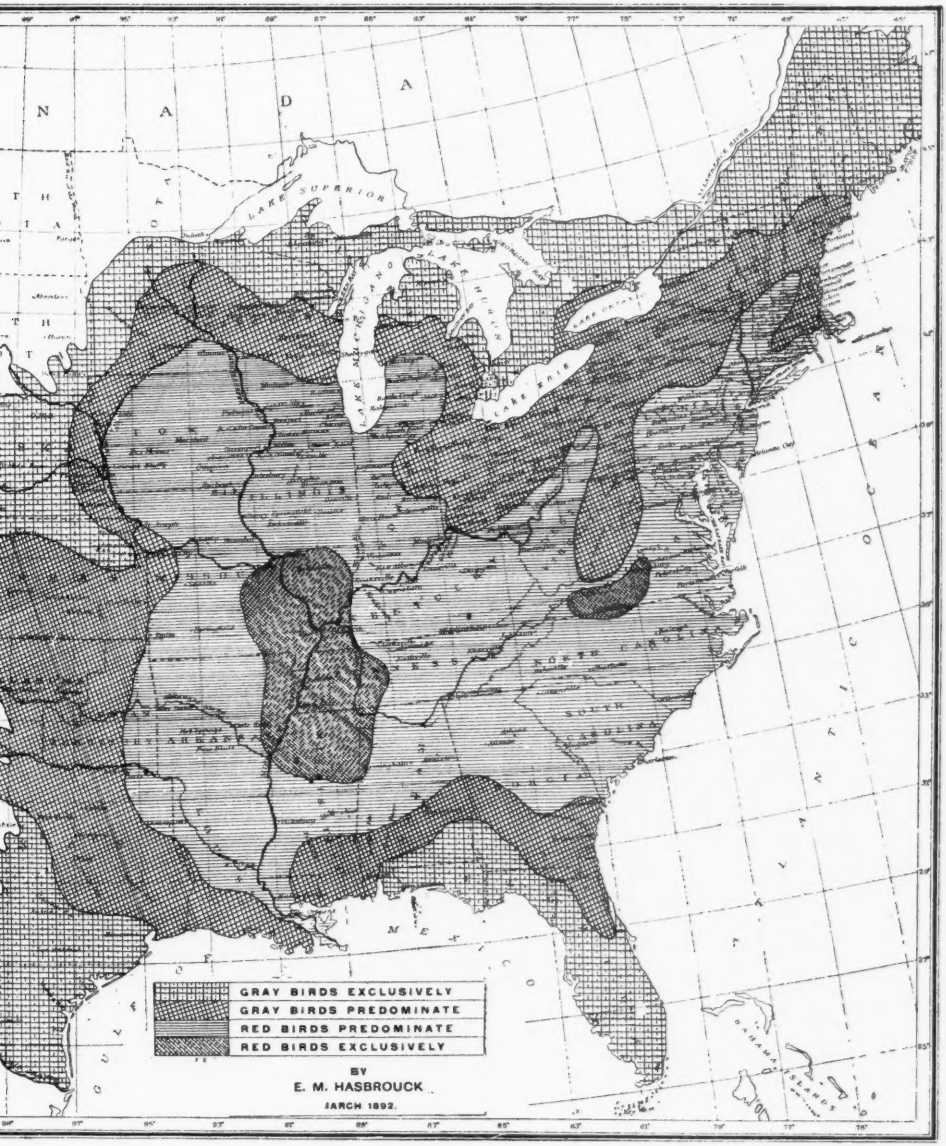
MAP I.

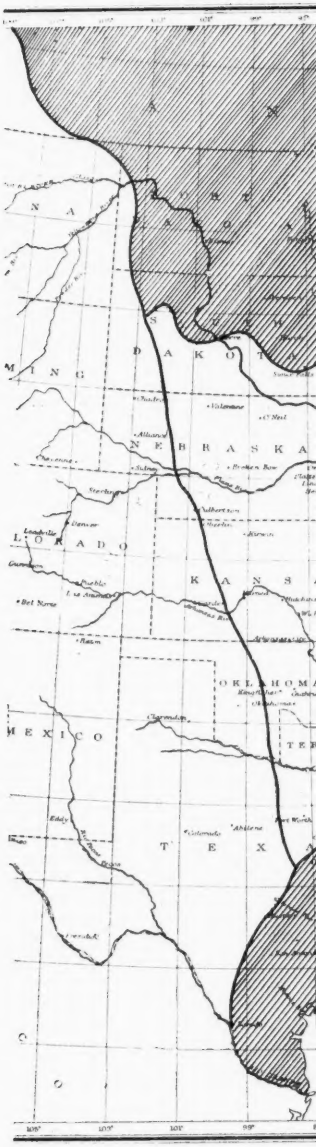


This map is not to be accepted as correct for distribution, it is given merely to show the relative positions occupied by the three forms.

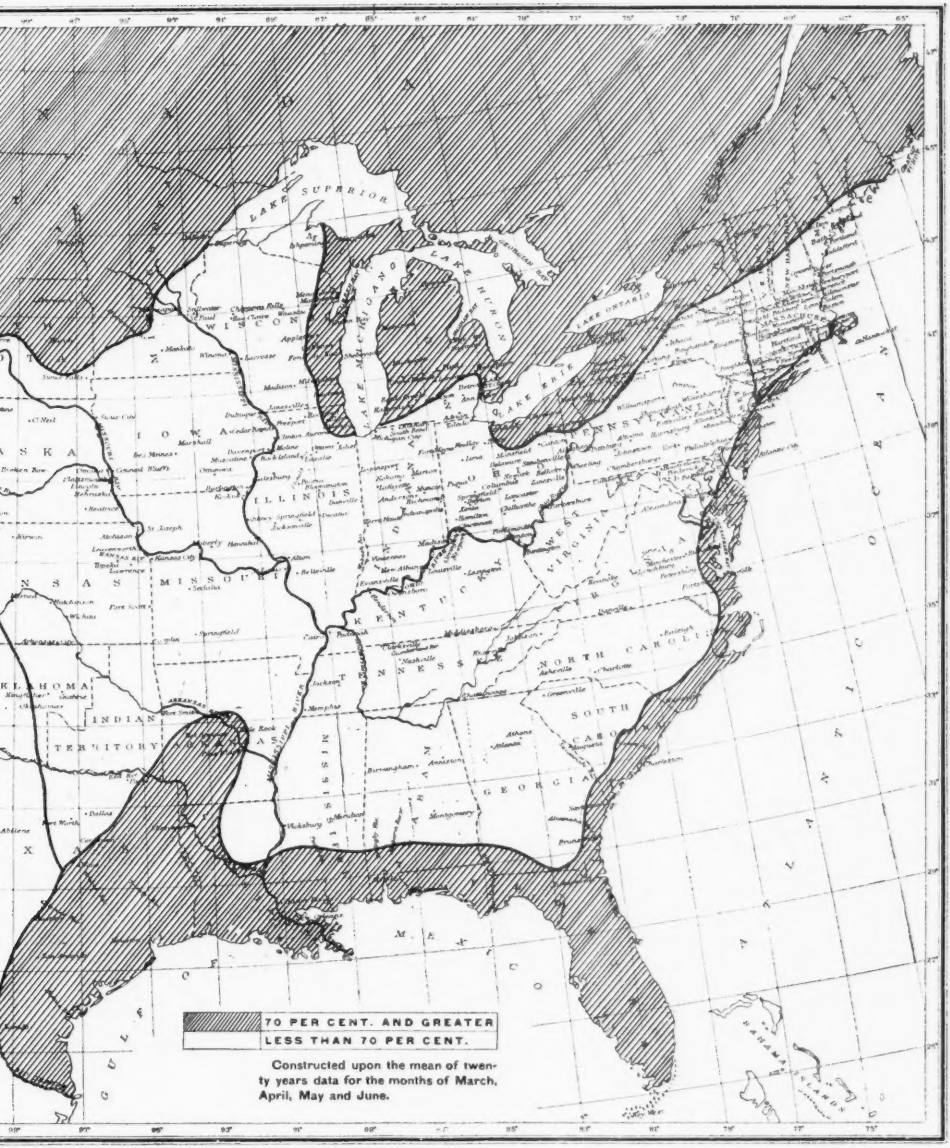

C A N
A S A
O R T H
D A K O T A
S O U T H
D A K O T
O M I N G
N E B R
O L O R A D O
M E X I C O
T E

MAP II.


GRAY BIRDS EXCLUSIVELY
GRAY BIRDS PREDOMINATE
RED BIRDS PREDOMINATE
RED BIRDS EXCLUSIVELY
BY
E. M. HASBROUCK
MARCH 1892.

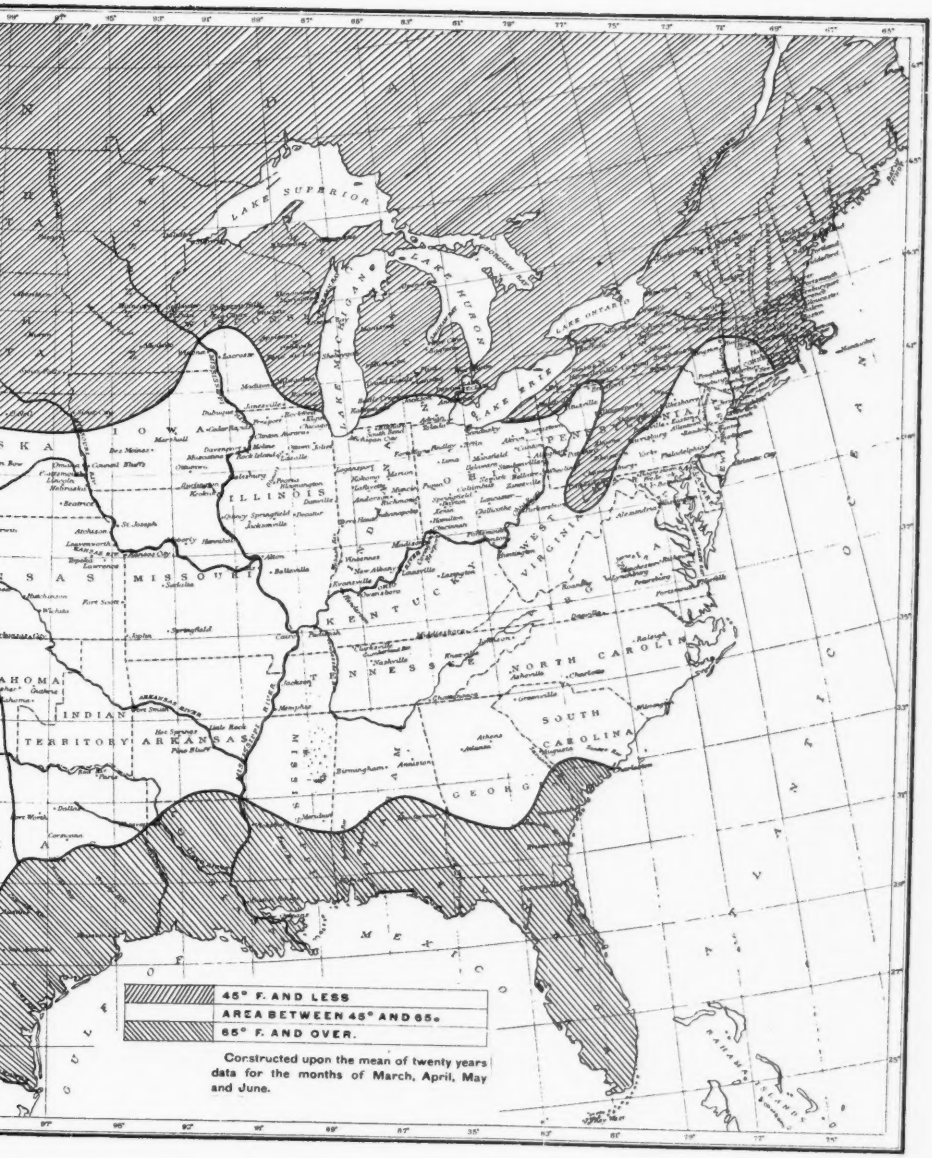

D A K O T
NEBRASKA
K A N S
MEXICO
T E X

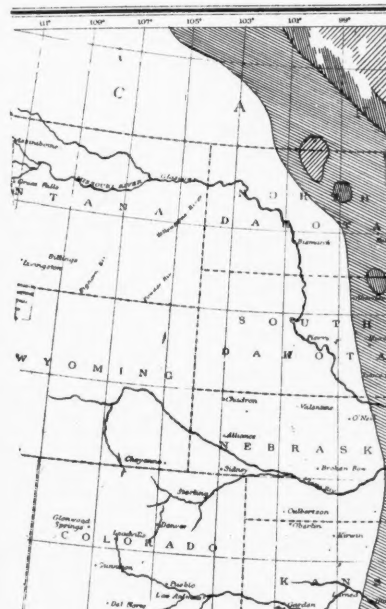
MAP III.


LAKE SUPERIOR
LAKE MICHIGAN
LAKE HURON
LAKE ERIE
LAKE ONTARIO
WISCONSIN
IOWA
ILLINOIS
MISSOURI
KENTUCKY
TENNESSEE
INDIAN TERRITORY
NORTH CAROLINA
SOUTH CAROLINA
GEORGIA
70 PER CENT. AND GREATER
LESS THAN 70 PER CENT.
Constructed upon the mean of twenty years data for the months of March, April, May and June.

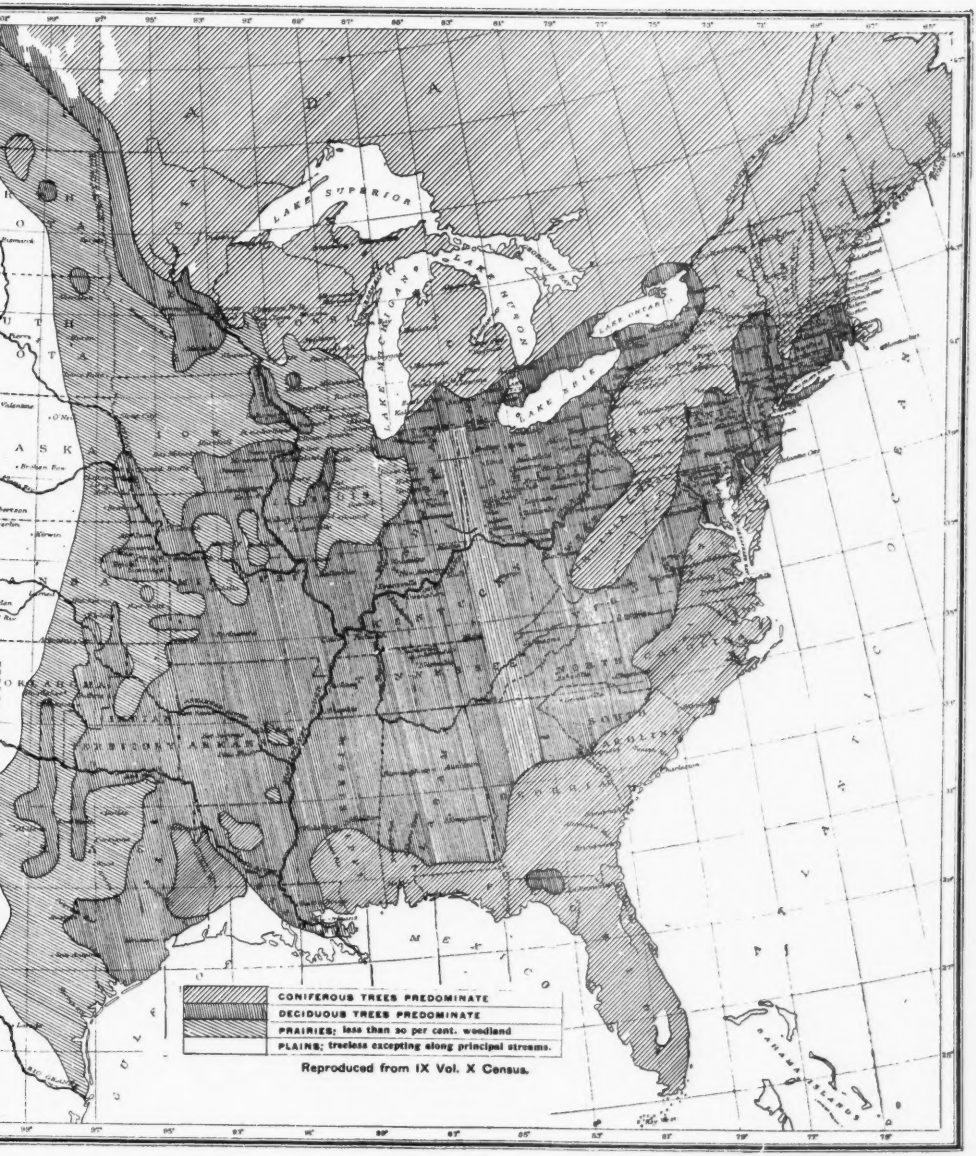

NEBRASKA
KANSAS
TEXAS
Denver
Pueblo
Abilene
Colorado

MAP IV.


LAKE SUPERIOR
LAKE MICHIGAN
LAKE HURON
LAKE ONTARIO
LAKE ERIE
ILLINOIS
MISSOURI
KENTUCKY
VIRGINIA
NORTH CAROLINA
SOUTH CAROLINA
INDIAN TERRITORY
ARKANSAS
MEXICO
ATLANTIC
45° F. AND LESS
AREA BETWEEN 45° AND 65°
65° F. AND OVER.
Constructed upon the mean of twenty years data for the months of March, April, May and June.


WYOMING
COLORADO
NEW MEXICO
NEBRASKA
SOUTH DAKOTA
Cheyenne
Denver
Pueblo
Las Animas
Sidney
Alliance
Chadron
Valentine
Billings
Livingston
Glenwood Springs
Leadville
Gunnison
Raton
Clarendon
Eddy
El Paso
Deming
Pecos
Presidio
Laredo
Bismarck
Garden
Kirwin
Culbertson
Oberlin
Broken Bow
Missouri River
Great Falls

MAP V.



Reproduced from IX Vol. X Census.

D.—Influence of Forest Areas.

In speaking of the two color phases, the terms "reds" and "grays" have been used, and when applied in their broadest sense, refer to the predominating colors, and consequently to those areas in which either color is in the majority. On map No. 2, the light and dark areas represent respectively the territory in which the red and gray phases predominate. Map No. 5 shows the predominating distribution of the two great divisions of our forest trees—deciduous and coniferous—the lighter shade indicating the region where the conifers are in the majority, and the darker the deciduous. Now, by a comparison of the two, it will be seen that the distribution of the color phases of the screech-owl coincides, to a large extent, with the distribution of the coniferous and deciduous forests. This similarity of distributions between fauna and flora was so striking, that to ascertain whether or not there was any real connection between the two, a similar state of affairs was looked for, and found in the case of the tawny owl (*Strix aluco*) of Europe. This bird furnishes a somewhat parallel case to that of *Megascops*, as in England, where it is stated that the forests are largely deciduous—Yarrell writes[6] that red is the predominating color, while in Scotland, coniferous as a whole, Mr. John A. Harvie-Brown informs me that the reverse is the case.[7] Coniferous forests in the eastern part of the United States have a grayish cast, and the point to be brought forward is that where the general aspect of the forest growth is gray, gray birds are found. As an instance, in the South where the forests are largely bald cypress (*Taxodium distichum*), and covered with a profusion of Spanish moss, the whole country is decidedly gray, and here the gray birds are almost the exclusive form known.

[6] History of British Birds, 4th Ed., I, 153.

[7] On the Continent, in Europe, it appears to be a pretty-well established fact that the red birds are females, and the grays males, which is a remarkable state of affairs when compared with existing conditions on the British Isles.

With the screech-owl, of 55 pairs known to have been actually mated, 39 males and 28 females were red, while 27 males and 24 females were gray, showing that *Megascops* is in no way approaching the condition of *Strix*.

There are at least three places on the map where this similarity of distribution is wanting, as, for example, the deciduous region extending from central New York southwestward through Ohio and northern Indiana, where gray birds predominate, also the territory along the Atlantic coast most decidedly coniferous where red birds are found, and the western boundary of the species from north to south, where little or no timber occurs, and when found is mostly deciduous, and where gray is the predominating color. With these exceptions the similarity is remarkable, while the discrepancies are in a measure compensated for by the hygrometric conditions existing in the localities mentioned.

Conclusions.

From the foregoing it is evident that the red phase is confined mainly to *Megascops asio* (I am speaking of it as a whole), which, on its northern border, merges into the gray phase; that the southern gray belt incompasses *floridanus*, while in eastern Texas the few red specimens of *mccallii* that are known have been taken from the extreme north-eastern portion of its range, which is influenced both by humidity and temperature (see maps). Again this distribution of color corresponds very closely to the life areas—the gray phase of the Florida form in the South occupying a major portion of the Austroriparian; the red phase of *asio* proper conforming very closely to even the outlines of the Carolinian, while the gray phase is equally identical with the Alleghanian.

It is worthy of note that the gray phase of *Megascops asio* is boreal in its affinities, and that where a gray phase of *asio* is found that is not boreal, it is recognized as a subspecies.

Now if *floridanus* (gray) is separable from *asio* just north of it (red), it seems highly probable that *asio* (red) will some day be separated from the gray phase on the north. It has been shown that as regards the two phases of *asio*, certain areas are inhabited exclusively by reds, certain ones exclusively by grays, while still others are inhabited by a mixture of the two, and that three forms (*floridanus* and two color phases of asio proper) inhabit, as a whole, entirely distinct areas. No one

will deny that all of the forms of *Megascops* are descended from a common ancestor, and if through climatic or environmental conditions they have become subspecifically differentiated in various localities, I see no reason to doubt that in like manner under the influence of humidity, temperature, acquired character and forest area, which will be felt for countless generations to come, that the species now known as *Megascops asio* will one day be separated into species and subspecies,—the former represented by the original gray, and the latter by the more modern red.

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RECENT LITERATURE.

A Popular Botany.[1]—This pretty book professes to enable one who has never studied botany to have a "bowing acquaintance" with the common wild flowers, certainly a most laudable undertaking. The author appears to have fallen largely under the baleful influence of the old-fashioned teachers of botany, characterized not inaptly by the line she quotes from Emerson—

"And all their botany is Latin names"

which may account for the impression she has that a scientific arrangement or even a "key" must be repellant to the amateur, or "bristling with technical terms and outlandish titles." This book is an honest effort to bring some knowledge of plants nearer to the non-botanical man and woman who may have a natural love of the flowers of the wayside and fields.

At the opening of the book are a few pages devoted to the explanation of terms, in which we find what is so common in popular works—that many of the definitions do not define. There is a woful mixing up of physiological with structural definitions, which must prove as troublesome to the amateur who has a horror of technical terms which "bristle," or of titles which are "outlandish." How much help will the reader get from this definition?—"The Stamens are the fertilizing organs of the flower." Some of the definitions are good enough, and will, perhaps, serve their purpose.

The "Flower Descriptions" are grouped under six heads, viz.: White, Yellow, Pink, Red, Blue and Purple, Miscellaneous. This part is pretty well done, and includes descriptions and many good illustrations of the more striking common flowers of the region within one or two hundred miles of New York City. The provincialism of the book is shown in its title, where the flowers of this limited region are called "*our* common wild flowers," and again on page X, where we find the expression, "this side of Chicago," which makes one ask where is "this side?" The title should be changed so as to restrict the book to the New England and Middle States, in which region it will be a useful book for amateurs. The author should remember that there are "common wild flowers" and multitudes of people who admire them in the South, upon the prairies and plains, in the Rocky Mountains, and in the States of the Pacific Coast. "Our common wild flowers" is an

[1] "How to Know the Wild Flowers." A guide to the names, haunts, and habits of our common wild flowers, by Mrs. William Starr Dana; illustrated by Marion Satterlee; small, 8vo, 298 pp. New York: Charles Scribner's Sons, 1893.

expression with a very different meaning in different parts of the country.—CHARLES E. BESSEY.

Two Text-Books of Physiology.[2]—The State of Indiana has gone into the business of loaning its name as endorsing certain text-books, which are published as the "Indiana State Series." These two books, by Professor Jenkins, now of the Leland Stanford University, belong to the series. Of the advantages and disadvantages of such a course, much might be said; but for this we have no room aside from the remark that in our opinion the disadvantages far outweigh the greatest advantages gained—the publication of the books at reasonable rates, the prices of the two volumes being fixed by law at thirty and sixty cents respectively.

Dr. Jenkins has done his work well in both volumes, the "Advanced" work being the better of the two—the "Primary" being too old in its style for the students for which it is intended. In each work there is a freshness of style and a logical arrangement which please us, and the greatest fault we can find with the work is the insertion of "review questions" which were doubtless demanded by the publishers (we might say parenthetically that Professor Martin's otherwise excellent "Human Body, Briefer Course," is damaged by the same operation.) Especially admirable is the treatment of the use of alcoholic stimulants, narcotics, and the like. There is no lurid description of the drunkard's stomach, no intemperate use of adjectives, but rather a plain, common-sense view of the matter which will be as effective as the more extravagant statements so common in the suppression of intemperance. In short, we regard these books as among the very best for schools of the grammar and high school grades, and can but wish that they might supplant, in other States than Indiana, the trashy works so commonly in use.

Calderwood on Mental Evolution.[3]—This octavo of 350 pages is written with the object of harmonizing the modern doctrine of evolution or physical continuity, with the doctrine of non-continuity of mental evolution, so far as regards man. The author endeavors to show that while the physical structure of man may have been the result of an evolutionary process, his mind presents too great a differ-

[2] O. P. Jenkins. Primary lessons in human physiology. Indianapolis, 1891, pp. 211.
O. P. Jenkins. Advanced lessons in human physiology. Indianapolis, 1891, pp. 318.

[3] Evolution and Man's Place in Nature, by Henry Calderwood, LL.D., Professor of Moral Philosophy in the University of Edinburgh. Macmillan & Co., 1893.

ence from that of any of the lower animals to permit us to believe in its origin by a similar process. He regards mind properly so-called, as restricted to man, asserting that animals possess "sensible discrimination" only, while man possesses "rational discrimination." He thus defines the latter power.[4] "Negatively, intelligence is non-sensible discrimination, a distinguishing of difference to which sensibility is unequal. Positively, intelligence is discrimination of the meaning of sensible impressions." This kind of intelligence Dr. Calderwood denies to the animals below man. Few or no naturalists familiar with animals will concur in restricting Dr. Calderwood's intelligence as here defined, to man. It is certain that a great many, if not the majority, of animal species "discriminate" to varying degrees, "the meaning of sensible impressions. Had the author desired a more certain criterion of difference between the animal and the human mind, it seems to us that he would have found it more surely in the capacity of the production of the concept, though it does not seem certain that this grade of mental action is entirely restricted to man.

The grade of mental activity displayed by animals can not, however, be excluded from the realm of mind. Indeed, when reduced to its lowest terms, mind appears as sense impressions, and it ceases only with the disappearance of consciousness. Such at least is the comprehensive definition which may be set off in contrast with no mind, or the realm of pure physical energy. Of course such a definition is not acceptable to the advocates of the non-continuity of mental evolution.

In accordance with the latter view, Dr. Calderwood does not admit that intelligence is related to physical structure (p. 178), although many convincing proofs to the contrary can be found in the annals of brain pathology. He regards passion and not intelligence as the active guide in animal evolution. He regards instinct (pp. 179–187) as not intelligence in any form. He closes with an eloquent defense of Christianity, as though the doctrine of the continuous evolution of intelligence conflicted with it.

It seems to us that in making comparisons between the minds of men and animals, we learn most by using the lowest types of man. Comparisons between the latter and the highest types of men are also very instructive. If the continuity of mental evolution has been interrupted, some interruptions during human evolution might be found as well as prior to it.

Dr. Calderwood's book is interesting as showing what can be said on the non-evolutionary side of psychology. There is much of interest in it, but we do not find his reasoning conclusive.—C.

[4] P. 151.

General Notes.

GEOLOGY AND PALEONTOLOGY.

The Norian Rocks of Canada.—Professor F. D. Adams of McGill College, Canada has published a memoir on the Norian or Upper Laurentian rocks of Canada.[1] This memoir is the result of five seasons' field-work conducted for the Geological Survey of Canada, supplemented by a laboratory investigation of the rocks constituting the Norian series. According to Professor Lawson, two important results of Mr. Adams' work are first, the clear recognition, as plutonic eruptive formations, of rock masses, which, being petrographically and geolographically units, have each an enormous extent. These are the Norian mass, which occupies nearly 1000 square miles; and the Saguenay mass, which is about six times that area. These masses, which may be termed batholites, are characterized by a distinct type of rock known as anorthorite.

The second important result is the immense simplification effected in Archaean geology in the Canadian territory. (Science, May, 1893.)

The Caudal Fin of Ichthyosaurian Reptiles.—In discussing the recent advances in knowledge of the Ichthyosaurian reptiles, Mr. R. Lydekker refers as follows to an important paleontological discovery which confirms Sir Richard Owen's conclusions that the Ichthyosauri possessed a caudal fin.

"From the circumstance that nearly all their skeletons found in the English Lias have a dislocation in the vertebræ of the tail, Sir Richard Owen was led many years ago to the conclusion that the Ichthysaurs were furnished with an expanded fin at the end of the tail, and that the weight of this fin caused the fracture in question. In the present year, there has been discovered in the Lias one of these reptiles, in which the outline of the fleshy parts is completely preserved, and which proves the existence of a caudal fin of still larger dimensions than Owen supposed to be the case. This interesting specimen is described by Dr. Fraas (*Neue Jahrbuch f. Mineralogie*, 1892, pp. 87-90). We already knew that in the paddles the fleshy part was extended much behind the bony skeleton; but the new specimen shows us that, in addition to the tail-fin, the Ichthyosaurs had a triangular fin on the middle of the back, behind which was a crest of horny excrescence compared to those of the crested newt. The tail fin is vertical and nearly symmetrical

[1] Ueber das Norian oder Ober-Laurentian von Canada. Stuttgart, 1893.

externally, although the backbone runs downward to terminate in its lower lobe. In this respect the fin has the same general aspect as in the Sharks, except that in the latter the backbone runs into the upper lobe. It shows, indeed, as Dr. Fraas remarks, how closely analagous is the form of Ichthyosaurs to fishes." (Natural Science Vol. I, 1892.)

New Fossil Fishes from the Upper Lias.—Continuing his studies of the fossil fish from the Upper Lias of Cement of Vassy of the Youne, M. Sauvage describes and figures three new species; *Leptolepis affinis* Sauvage, *L. antissiodorensis* Sauvage, and *Pholidophorus gaudryi* Sauvage. The first resembles *L. constrictus* Egerton, but differs from that species by having the preopercular strongly striated, a longer body, more numerous vertebræ, and the ventral fins further back. *Polidophorus gaudryi* is very close to *P. bechei* Ag. and *P. onychius* Ag., it has, however, a longer head, and the scales not so elevated and less numerous than either of these species. It may be identical with *P. dorsalis* Ag., but the description of that species is too meager to allow full comparison. (Bull. de la Soc. d'Hist. Nat. d'Autun, 1892.)

Affinities of Ichthyornis.—Dr. R. W. Shufeldt has published a tabular comparison of the anatomical points of *Ichthyornis dispar*, *Rhynchops nigra* and *Sterna macrura* to show that while in some minor characters *Ichthyornis* seems to come nearer the Gulls than it does the Terns, on the whole it possesses more in common with our now existing Rhyncopidæ than with the Sterninæ. This is most apparent in the cranium; in the large skull compared with the rest of the skeleton; and in certain characters in the vertebral chain and pelvis. (Journ. Anat. and Physiol. Vol. XXVII.)

Cretaceous Formations of Mexico.—Mr. R. T. Hill has recently shown that the Mountain Limestone so widely distributed throughout Mexico is the southern continuation of the Comanche Series of Texas, and is therefore of Lower Cretaceous age instead of Upper Cretaceous and Paleozoic, as has been asserted. The author has recognized the three prominent stratigraphic divisions of the Comanche Series in Mexico as in Texas, and is confident that when the whole region is studied more detailed resemblances of horizons will be observed.

The true Upper Cretaceous is characterized by shallow deposits of ferruginous limestones, clays, sand and lignite. The beds occur in the northeastern border States of Chihuahua, Coahuila and Tamaulipas, and

are at least 5000 feet thick. The subdivisions of this series are not distinctly differentiated. The Dakota horizon has no true representative, but the Benton shales and clays with the typical *Inoceramus problematicus* and *Scaphites* occur near Juarez and in El Paso, Texas. The chalky beds of the Niobrara sub-epoch are missing, and the whole of the Niobrara. Pierre is apparently represented by thinner ferruginous clays and impure limestones marked by a commingling of the characteristic fauna and the *Exogyra ponderosa* of the Southern States. The Eagle Pass beds, correlated by White with the Fox Hill stage grade into the Laramie, and the latter into the Eo-Lignitic beds of the Southern States, the whole having a unity of littoral lithological features indicating that the Upper Cretaceous and basal Eocene from the Dakota to the Claiborne inclusive was a continuous epoch of sedimentation, without any serious interruption of continuity until toward its close, and deposited at a marine base level now occupied by the eastern masses of the Rocky Mountains and eastern Sierra Madre. (Am. Journ. Sci., Vol. XLV, 1893.)

On a new Musteline from the John Day Miocene.—In striking contrast to the Tertiary formations of Europe, those of North America have yielded but very few mustelines. From the White River beds only the problematical genus, *Buncelunus* Cope, the systematic position of which is quite uncertain, has so far been obtained, and the John Day beds have hitherto yielded no members of the family. For this reason, even scanty fragments are of importance. Among the collections of the Princeton expedition of 1889 is a mandibular ramus containing only $p\underline{2}$ and $p\underline{3}$, but displaying the alveoli of the other teeth, which was found in the John Day beds at Silver Wells, Oregon. It is obvious at the first glance that this jaw cannot be referred to any genus of carnivores hitherto known from the John Day, and though the absence of the characteristic teeth renders the framing of a generic definition very difficult, yet it is possible to so define it as to make identification of other specimens easy.

Parietis gen. nov., Dental formula $C_{\overline{1}}\ P_{\overline{4}}\ M_{\overline{3}}$. $\overline{p2 \text{ and } 3}$ small very low, but relatively thick, massive, obtusely pointed and with a cingulum around the entire crown; enamel coarsely wrinkled. Molar alveoli decreasing in size from 1st to 3rd; $\overline{m3}$ implanted by a single fang. *P. princeous* sp. nov. Mandible short but thick and heavy, with a larger mental foramen beneath $p\underline{2}$ and a smaller one beneath $p\underline{3}$, $\overline{p1}$ very small and inserted by one root. Size small. Length of molar-premolar series: M. ·032. Length of $\overline{p2}$, ·005: Width of $\overline{p2}$ ·003. Length of alveolus of

$\overline{m1}$ ·007: of $\overline{m2}$ ·005. Depth of jaw beneath $\overline{p3}$ ·010. The character of the premolars suggest those of *Inercytherium*, but *Parietis* was no creodont, the molar alveoli clearly showing the presence of one sectorial and two tubercular molars, and the whole appearance of the specimen is musteline. Of the European genera *Stephanodon* von Meyer, appears to be most like *Parietis* but differs in many particulars, e. g. in having but two lower molars.—W. B. Scott, *Geological Museum, Princeton, N. J.*, May 24, 1893.

The Mammals of the Deep River Beds.—The Tertiary beds of the Deep River, Montana, were discovered by Grinnell and Dana in 1875. These observers recognized two distinct horizons in the formation, which they called respectively "Miocene" and "Pliocene," without attempting a more exact correlation. In 1878, Cope referred the formation to the base of the Loup Fork, but afterward regarded it as a distinct epoch (Ticholeptus beds), intermediate between that formation and the John Day.

The Princeton expedition of 1891 made extensive collections in the Deep River Valley, and the examination of these has brought to light some interesting new forms, upon which the following preliminary notes are founded. A full description, with figures, is in preparation.

The beds contain, as Grinnell and Dana pointed out, two very distinct faunas, the older one of which is equivalent to the John Day, and the newer to the "Ticholeptus beds" of Cope. The lower strata, from a few very small exposures, yielded numerous specimens of the following forms: *Cynodesmus thooides* gen. et. sp. nov.; *Steneofiber montanus* sp. nov.; *Cœnopus* sp.; *Miohippus annectens?* Marsh; *M. anceps?* Marsh; *Mesoreodon chelonyx* gen. et. sp. nov.; *M. intermedius* sp. nov.; *Poëbrotherium* sp.; *Hypertragulus calcaratus* Cope.

The upper beds, from which alone Professor Cope's collections appear to have been obtained, contain a very different fauna. The following list is made from a comparison of Professor Cope's material with that gathered by the Princeton party: *?Canis anceps* sp. nov.; *Chalicotherium* sp.; *Aphelops fossiger* Cope; *Miohippus* sp.; *Anchitherium equinum* sp. nov.; *Desmatippus crenidens* gen. et sp. nov.; *Protohippus sejunctus* Cope; *P. (Merychippus) insignis* Leidy; *Merychyus zygomaticus* Cope; *M. pariogonus* Cope; *Merycochœrus montanus* Cope; *Cyclopidius simus* Cope; *C. emydinus* Cope; *C. incisivus* sp. nov.; *Pithecistes brevifacies* Cope; *P. decedens* Cope; *P. heterodon* Cope; *Protolabis* sp.; *Procamelus* sp.; *Blastomeryx borealis* Cope; *B. antilopinus* sp. nov.; *Mastodon proavus* Cope.

Cynodesmus gen. nov.—Dentition like the microdont forms of *Canis*, but with the skull structure of the more ancient genera. Cerebral hemispheres small, not overlapping the olfactory lobes or cerebellum, with fewer and simpler convolutions than any of the recent *Canidæ*. Post-glenoid foramen concealed or absent.

C. thooides sp. nov.—Dentition microdont; deuterocone of $\frac{p^4}{}$ relatively large; face short and cranium long; small frontal sinuses present; mandible non-lobate; size medium.

This genus represents the direct canine ancestor which the John Day beds have hitherto failed to yield. Found by O. C. Mortson in the lower strata.

? Canis anceps sp. nov.—A fragment of mandible containing $\overline{p4}$, $\overline{m1}$ and $\overline{m2}$ agrees well with *C. brachypus* Cope, except for its smaller size and more slender jaw. The lower sectorial is nearly as long as in that species (as 17 : 19), but the depth of the mandible is much less (as 21 : 30.) The primitive character of the sectorial renders the generic reference uncertain. Upper beds.

Steneofiber montanus sp. nov.—This species is most like the *S.* (*Castor*) *peninsulatus* Cope from the John Day of Oregon, but the upper molars (except $\frac{m^3}{}$) have but two fossettes, both of which are anterior to the enamel inflection. In the lower molars the antero-posterior diameter of the crown exceeds the transverse. Found by C. C. Jefferson in the lower beds.

The name *Anchitherium* has been much too extensively applied to American equines. The following table will show the generic distinctions in the Miocene forms of this group which appear to be justified by present knowledge.

I. *Teeth brachyodont.*

A. Conules of upper cheek teeth well-marked; posterior transverse crest not reaching the outer wall; external cusps moderately concave or flattened; anterior pillar of lower teeth distinctly marked.

1. No cement present.

a. Incisors without enamel pits	*Mesohippus* Marsh.
b. Upper incisors with enamel pits.	*Miohippus* Marsh.

2. Cement on cheek teeth.

Posterior transverse crests of upper teeth confluent with the external wall. *Desmatippus* gen. nov.

B. Conules of upper cheek teeth much reduced, and external cusps deeply concave; posterior transverse crest confluent with outer wall; anterior pillar of lower teeth reduced and on one or more teeth absent. No cement; incisors with pits. *Anchitherium.*

II. *Teeth hypsodont.*

1. Antero-internal cusp of upper teeth confluent with transverse crest. *Protohippus* Leidy.

2. Antero-internal cusp separate from transverse crest. *Hipparion* de Christol.

Desmatippus gen. nov.—Molars and premolars short crowned, the valleys more or less filled with a thin deposit of cement. In the upper series the posterior transverse crest is connected with the outer walls and sends forward a process which extends nearly to the anterior conule. Inner cusps of lower teeth expanded so as to narrow entrances to the valleys. Median inner cusps (a, a′ of Rütimeyer) much more distinctly separated than in the older genera.

D. crenidens sp. nov.—Posterior transverse crests of upper cheek teeth sinuous; limbs elongate and slender; size moderate.

This interesting new equine very satisfactorily fills the gap between *Miohippus* and *Protohippus*. The type specimen was found by I. Benet in the upper strata of the Deep River.

Anchitherium equinum sp. nov.—Size equal to that of *A. aurelianense*, but with teeth relatively larger; lower incisors without enamel pits; humerus with bicipital tubercle and double bicipital groove.

This is the first American species of *Anchitherium* in the restricted sense in which that name is here employed. It was found by Mr. Benet in the upper beds.

Mesoreodon gen. nov.—Skull and dentition very much as in the John Day genus *Eporeodon* but with "adaptive" names, the 3d metacarpal articulating with the trapezoid and excluding the 2d from the magnum.

M. chelonyx sp. nov.—Metapodials rather short and stout, ungual phalanges trowel-shaped and pointed.

This is the most abundant animal of the lower beds, and nearly all parts of the skeleton are known. Two very curious features are the presence of a rudimentary clavicle and of an ossified thyroid cartilage of the larynx. The type was found by O. C. Mortson.

M. intermedius.—Metapodials slender and elongate, and ungual phalanges like those of *Merychyus*. Lower beds.

Cyclopidius incisivus sp. nov.—Like *C. simus*, but having two small incisors in each premaxillary; the latter bones also of a different

shape from those of the former species. Found by R. A. Stevenson in the upper beds.

Blastomeryx antilopinus sp. nov.—Size decidedly smaller than that of *B. borealis* Cope, and ribs of external crescents on upper molars less prominent. Found by O. C. Mortson in the upper beds.

Besides the new forms here enumerated excellent materials were found of species already named, including some nearly complete skeletons, which will be fully described in the memoir now in preparation.

W. B. Scott.

Geological Museum, Princeton, N. J., June 9, 1893.

Conditions of Erosion beneath Deep Glaciers.—Mr. N. S. Shaler has published a paper on the conditions of Erosion beneath deep glaciers, based upon a study of the Boulder Train from Iron Hill, Cumberland, R. I. The author advances an hypothesis of pressure melting to account for unexplained peculiarities of glacial movement, such as sudden variations of a temporary nature in the position of the ice, and the movement of the ice in the direction of the glacial flow over surfaces of slight inclination. It also accounts for the small amount of erosion often traceable in the central parts of a glaciated district, and explains the phenomena exhibited by drumlins or lenticular hills. (Bull. Harv. Mus. Comp. Zool., Vol. XVI, 1893.)

Paleozoic.—Mr. Whiteaves has published a list of 16 gasteropods found in the Trenton limestone of Manitoba, of which, one *Loxonema winnipegense*, is new. The new species is of interest on account of its close similarity to some of the most typical Jurassic species of *Pseudomelania*. (Can. Rec. Sci. April, 1893).—A new fungus, *Incolaria securiformis*, is reported by Mr. H. Herzer. It was found under the bark of a Sigillaria imbedded in the Zoar limestone of Tuscarawas Co., Ohio and represents a new genus. (Am. Geol. June, 1893). A new fern from the Coal Measures of Henry Co., Missouri, is described and figured by Mr. David White in the Bull. Geol. Soc. Amer., 1893 under the name *Tæniopteris missouriensis*. According to the author the new species presents a striking combination of tæniopteroid and alethopteroid characters.

Mesozoic.—Mr. N. H. Darton has defined a thin series of arenaceous deposits lying between the Potomac and Severn formations, to which he gives the name Magothy formation. Its stratigraphic position places it in the early Cretaceous. (Ann. Journ. Sci. 1893). Mr. P. B. Brodie

reports the discovery of fossil fish and labyrinthodonts in the Green Gritty Marls, immediately overlying the Red Marls of the Upper Keuper in Warwickshire. The fish are represented by scales, numerous large and small spines of cestracionts, and the palatal teeth of *Acrodus keuperinus;* the labyrinthodonts, by fragments of bones only. (Quart. Journ. Geol. Soc., May, 1893.)

Cenozoic.—Mr. Lydekker has described and figured three new Cetaceans:—*Zeuglodon caucasicus* characterized by its small size; *?Platanistidæ*, represented by an associated series of four cervical, and the first dorsal, a lumbar, and a caudal vertebra; *Iniopsis caucasica*, which has maxillary fossæ of the Inia type. The fossils in question were found in Eocene strata of the Caucasus Mountains. (Proceeds., London, Zool. Soc., Nov., 1892).—Mr. J. S. Diller has published evidence to show that the Shasta-Chico series in California and Oregon is the result of continuous sedimentation, and that there is a faunal break in Oregon between the Chico and the Tejon. (Bull. Geol. Soc. Am., Vol., 4, 1893.)

Mr. E. T. Dumble reports a bed of Volcanic Dust in Texas. Its stratigraphic position is in the brown-coal series of the Fayette beds, and, if the correlation of these beds be correct, of Miocene age. (Trans. Texas Acad. Sci., 1892.)

BOTANY.

The Plants of the Bahamas, Jamaica, and Grand Cayman.—Professor A. S. Hitchcock's paper on this subject, which appeared in the Fourth Annual Report of the Missouri Botanical Garden, is very interesting, inasmuch as it not only catalogues a large number of species, but in addition discusses at some length some of the problems connected with insular floras. The following are some of the author's conclusions.

"It would seem to the writer that the ordinary methods of dissemination would account for the flora of the Bahama Islands without calling in the aid of hypotheses founded on ancient land connection. There are probably no more endemic species than would be found if all the islands were at present connected. It seems hardly reasonable to suppose that Watling's, Crooked Island or Inagua have ever been connected with Cuba or any of the other islands, yet the flora of these have about the same relation to Cuba as do the islands of the Bahama bank. From the table it will be seen that the flora comes from the south, that it is essentially Cuban and that this flora has also established itself in the extreme southern part of Florida, where it is found only on the most recent formations. Climatic conditions undoubtedly prevent any great extension to the north, but most of the plants would probably extend further north than they do, were they not brought into competition with an established flora. On the other hand very few plants from the Southern States have found their way to the Bahamas, and those that have are mostly such as are of wide distribution in the Tropics and hence just as probably came from the south as from Florida.

"Again, the facilities for distribution, the ocean currents and the prevailing winds, are from the south to the north. The Gulf Stream not only tends to bring plants from the south but quite effectually prevents any from drifting from Florida to the Bahamas. The current is so strong that the occasional northers would be more than counteracted, while the easterly winds are favored. What is true of the Gulf Stream to the west of the Bahamas is also true of the Equatorial Current to the east. Distribution by birds is apparently of little importance or we should find more plants with pulpy fruits brought from Florida. Maritime plants are easily distributed by currents as their seeds are not injured by the salt water, and furthermore, as stated by Hemsley

and Wallace, when cast ashore they find a suitable place for germination, while many other seeds although transported fail to be placed in a favorable situation. I collected several beans of *Gigalobium scandens* on various beaches, but the plant had not gained a foot-hold as its habitat is the dense woods of the larger islands. But the bulk of the flora of the Bahamas is either maritime or such as would, under favorable conditions, be likely to pass through the salt water ordeal successfully. The islands are all low and probably most of the species are found within the influence of the sea."

The Saprolegniaceæ of the United States.—The monograph of the Saprolegniaceæ of the United States, prepared by Dr. J. E. Humphrey, and published by the American Philosophical Society, is a notable contribution to the botany of the lower plants. It occupies eighty-six quarto pages of text, and is illustrated by seven large plates. The author first discusses the group in general, giving much attention to the non-sexual and sexual reproduction, and bringing out many interesting facts. He confirms the statement of DeBary and others that the so-called sexual reproductive organs are morphologically sexual, though not physiologically so in all cases.

The second part of the paper is occupied with descriptions of the genera and species. Seven genera are known to occur within our limits, viz: *Saprolegnia*, with seven species; *Pythiopsis*, with one species; *Achlya*, with eight species; *Aphanomyces*, with two species; *Dictyuchus*, with one species; *Leptomitus*, with one species; *Apodachlya*, with one species. A number of other species are described, of which as yet no specimens have been found in the United States. A bibliography of 110 titles is given, of which but five are by American authors. The plates add much to the usefulness of the paper, and should make the study of these much less difficult than heretofore.

Dr. Humphrey recommends the following method of cultivating these plants. "The most prolific source of supply is water containing green algæ, and the best subsistance is afforded by insects, such as common house-flies or meal-worms. For material, a handful of algæ may be taken from the stream, pond or pool in which they are growing and placed in a collecting bottle or other vessel, which will protect them from drying. In the laboratory, these are placed in a vessel of water from the public or private water supply, and the culture insects are thrown upon its surface. This collection of a mass of algæ without water, except that retained by the mass, reduces the bulk of specimens, which is of importance when they are taken at a distance from

the laboratory, and largely excludes aquatic organisms which might make trouble in the cultures; while experience shows that the zoöspores and oöspores of the *Saprolegniaceæ* are carried with the algæ to a large extent. * * * The insects used may be freshly killed, and their chitonous covering should be broken as little as possible; but I have found that for winter cultures, when fresh insects are not readily available, an excellent substitute may be found in dead house-flies, collected in the fall and kept dry and exposed to the air, but protected from dust. Since the dry surfaces of insects are not readily wetted by water, it has proved useful to moisten them, whether fresh or dried, with alcohol, and then soak them in water for a few minutes to remove the alcohol. They will then, when thrown into the culture vessel, sink until their bodies are mostly below the surface, and so present a much larger area to the swimming zoöspores of *Saprolegniaceæ* than if dry and floating largely above the surface."

The publication of this paper will certainly stimulate the more general study of these interesting aquatic fungi.

CHARLES E. BESSEY.

ZOOLOGY.

A Deformity Inherited.—An account is given in a medical journal by Dr. M. L. Holbrook of a case of deformity transmitted through three generations to both sexes. It appeared first in a person named M. B. Wadsworth, born in Connecticut about the year 1800. It consisted in the absence of the three middle metacarpal bones and phalanges of each hand, and also the absence of the three middle corresponding bones, the metatarsal and phalanges of each foot, together, of course, with the absence of the toes and fingers and that part of the foot and hand belonging to these bones. The remaining parts lay nearly side by side like fingers, and the movement was partly from side to side like claws, rather than a grasping movement, like that of a perfect hand. This man was very able bodied, and worked at farming and laying stone wall, and lived to be about sixty years of age. He married, moved to Ohio and being a neighbor of my parents, I knew him well. He had two children, S. and W. with whom I was intimate, and both inherited the deformity. In the oldest one, however, there seemed to be an attempt on the part of nature to restore the missing parts by producing one double finger on each hand, and a foot partly restored, but the restoration was so imperfect as to really make the deformity worse. This son died in early manhood and left no family. The second son, W., was nearly like the father in both hands and feet. He is still living, married, and has had four children. The first is a man, grown and is not deformed. The second, a girl, now about eighteen years old, is as bad as the father. The third, a son, not deformed. The fourth, a daughter, now dead, was like her father.

As to the cause of this strange deformity we have no absolute knowledge. One story current in the family is that the mother of the original case was frightened at a lobster before the child was born. There is another family belief concerning the cause that is worth relating. It is that the mother received a severe nervous shock from a vicious horse, which had chased her with open mouth and tried to get hold of her with his teeth after she had taken refuge under a wagon. The mental shock may have produced an arrest of development in the unborn child. (Herald of Health, Oct., 1892).

Preliminary Note on the Relationship of the Species Usually United under the Generic Name Sebastodes.—On the Pacific coast of temperate North America, a large number of species of viviparous Scorpaenidae are found. They range all the way from tide water to a depth of 1600 feet, from Cerros Island to Alaska. They are most abundant on the coast of California, about 30 species being known from San Diego and a like number from Monterey. In size, they vary from 1 lb. to 30 lbs.

The species have been variously grouped as forming one genus by Jordan & Gilbert, as forming two by Jordan, and as forming four by Gill. Jordan & Gilbert, in their Synopsis, arranged the species known to them according to the greater or less prominence of the spiniferous ridges of the skull. In examining the skulls of a number of them, one of us several years ago, noticed that in a number of species, the parietals meet over the supra-occipitals, while in others they are separated, and the supra-occipital is exposed above for its whole length.

A more recent examination of a larger series of skulls, tended to show that, if we admit the relationships pointed out by Jordan & Gilbert, this greater or less development of the parietals is of no significance. A more thorough study has, however, convinced us that the species with united parietals are related and that the relationships pointed out by Jordan & Gilbert are at fault.

The value placed on such a cranial character as the union or non-union of the parietals need not be defended here. It may only be mentioned that in *mystinus* which for other reasons we considered the hub to which the other groups proposed here are related as spokes, the parietals are united in 8 out of 10 specimens. The variation of this character in *mystinus* but confirmed our view that it is the radiating point.

Leaving the parietals, the next prominent characters are the development or non-development of certain cranial spines and ridges. These spines are found in all stages from minute points to comparatively huge spines. The variation in size for this reason, if there were no other objections, cannot be utilized for determining generic relationship. The spines are very regularly arranged and in any given species certain ones are always present. (Individual variations should of course be expected in this character as in every other if a sufficient number of specimens are examined). The *constancy* of the presence of certain spines in a given species warrants the use of the presence or absence of these spines in the different species in determining their

true relationship. This relationship is usually borne out by a number of subsidiary characters. Considering the constancy of the spines, reinforced by subsidiary characters, we have divided the species usually united under the generic name *Sebastodes* as follows:—

a. Parietals meeting above the supra-occipital.

b. Jaws equal; head narrow above; high and prominent cranial ridges ending in spines; preocular, supraocular, tympanic and parietals present. Scales usually very strongly ctenoid; accessory scales numerous; suborbital stay directed obliquely downward and backward; second anal spine much heavier than, and at least as long as the third; body short and deep, back arched; mouth very large; head heavy. All known species with cross bands.

SEBASTICHTHYS Gill.

*nigrocinctus, serriceps, rubrivinctus, diploproa.**

bb. Lower jaw much projecting; head broad, the skull usually convex; cranial ridges when present low; gill-rakers very long and slender; scales usually smooth, few if any accessory scales. Suborbital stay little if at all oblique.

c. Parietal ridges ending in spines; preocular, supraocular and tympanic spines well developed. Peritoneum black.

d. Postocular spine present. Second anal spine usually stronger and longer than third. Symphyseal knob strong, projecting forward. Dorsal low. (Peritoneum black, mandibles and maxillary scaled.)

ACUTOMENTUM[1] E & B.

[1]Type *A. ovalis* (Ayres).

*melanostomus, ovalis, rufus, *alutus, macdonaldi* n. sp. nov.= *S. proriger* E. & G. not of J. & G.

dd. Postocular spine not developed.

We have not been able to examine the two species (entomelas and atrovirens) and cannot vouch for their position.

cc. Parietal ridges not ending in spines.

e. Preocular spines well developed. Supraocular and tympanic spines sometimes present. Interorbital wide, convex. Peritoneum black. Approximated edges of sub-opercle and inter-opercle frequently ending in spines. PRIMOSPINA[2] E. & B.

[2]Type *P. mystinus* (J. & G).

The only species (*mystinus*) is the most variable species of the group.

ee. Preocular without spine, skull smooth, without spines. Peritoneum usually white

SEBASTOSOMUS Gill.

*flavidus, serranoides, melanops, *ciliatus.*

aa. Parietals separated by the supra-occipital.

f. Cranium with parietal ridges only. Lower jaw much projecting, entering the profile; a prominent symphyseal knob directed forward. Head broad, convex. Interobital convex, nearly smooth.

SEBASTODES Gill.

paucispinis, goodei.

*Species marked with an asterisk have not been examined in reference to the characters utilized.

ff. Cranium with many ridges, all ending in spines.

g. Postocular and tympanic spines both present. Interopercle and subopercle without spines. Lower pectoral rays normal.

h. Coronal spines; nuchal spines, a spine below, another in front of eye. * *matzubarae* with this species we are not acquainted.

hh. No coronal spines SEBASTOMUS Gill.

miniatus, pinniger, levis, aereus, constellatus, umbrosus*, rosaceus, rhodochloris*, gilli*, rupestris*, eos, chlorostictus*, ruber* rufus.*

gg. Postocular spine wanting.

i. Coronal spines none.

PTEROPODUS E. & B.[1]

Species with normal pectoral rays, (living off the bottom) *saxicola*, proriger†*, brevispinis*, elongatus, sinensis.*

Species with lower pectoral rays thick (living on the bottom) *zacentrus*, maliger, caurinus, vexillaris, rastrelliger, nebulosus, carnatus, chrysomelas.*

ii. Coronal spines present.

AUCTOSPINA E. & B.[2]

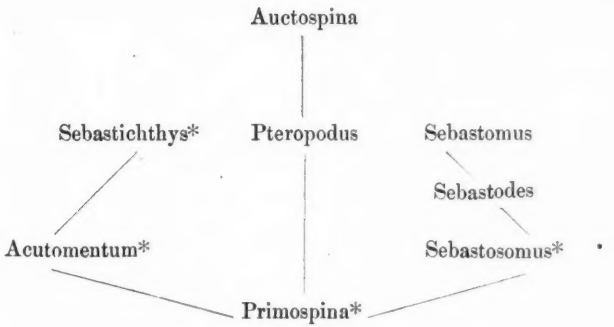
aurora, auriculatus.*

† The specimen described by E. & E., Proc. Cal. Acad. Sci. (2) III, 15, 1890, is a species distinct from *proriger.*

The inter-relationship of these genera is complex. It may be represented by the following diagram where the genera with the united parietals are followed by an asterisk.

[1]Type *P. maliger* (J. & G).

[2]Type *A. auriculatus* (Girard).



A revision of the Pacific Scorpaenidæ will be included in my "Viviparous fishes of the Pacific Coast."—C. H. EIGENMANN and C. H. BEESON.

Batrachians of British India.—The total number of Batrachians known at the present time from British India, including the Malay peninsula, comprises 147 species; of these, the Indian Museum possesses specimens of 103 distributed as follows; Ecaudata 99, Caudata 1, Apoda 3. (Sclater's List of Batrachians of the Indian Museum, 1892).

Washington and British Columbian Orinthology.—A resumé of the birds observed in British Columbia and Washington during the spring and summer 1892, is given by Mr. S. N. Rhoads in the Proceeds. Phila. Acad., 1893. To the combined lists of Mr. Chapman and Mr. Fannin, the author adds 21 species that came under his own observation, making the list of species now known from that region number 326. Descriptions of 11 new species observed appear in the Auk for January, 1893. Four specimens of a new variety of *Parus hudsonicus* were obtained in British Columbia, near Field. The new form, *P. hudsonicus columbianus*, is larger and darker than *hudsonicus*, with a much larger bill, and with the throat patch jet black instead of brownish-black.

Zoological News. Hemichorda.—Prof. W. E. Ritter presents in Zoe[3] a popular study of Balanoglossus in which few new facts concerning the larvæ are brought out. Professor Ritter puts in a request for evidence of the existence of Balanoglossus on the Pacific coast.

[3]Zoe iii, 187, 1892.

Fishes.—Evermann has revised[4] the North American Suckers of the genus Pantosteus and recognizes the species *plebeius, virescens, generosus, discobolus* and a new species *jordani* from the upper Missouri Basin.

Reptiles and Batrachia.—Cope catalogues[5] eight species of Batrachia, 5 of turtles, 8 of lizards and 13 of snakes collected in northwestern Texas. The region appears to be interesting as the meeting ground for several geographical districts. The absence of Sceleporus from the collections is due to the absence of timber.

Davenport records the persistence[6] of the right root of the subvertebral artery in an alligator 28 cm. long, and figures two cases of the persistence of the ductus botalli in the same animal.

Mammalia.—At a meeting of the London Zoological Society, M. Tegetmeier exhibited the feet of some Australian rabbits to show an adaptation which is gradually being brought about to a new mode of locomotion. The rabbits are becoming climbers, and often ascend trees in their search for food; their feet are growing slighter and the claws longer and sharper. (Revue Scientifique, Mar. 1893.)—Mr. G. S. Miller reports that *Zapus insignis*, hitherto known only from New Brunswick and Nova Scotia, is locally common in the eastern United States. As the original description was based on three specimens faded by grease and age, he redescribes the species in the Proceeds. Biol. Soc. Washington, April, 1893.

Notes on the Classification of the Cryptodira.—In the June number of the AMERICAN NATURALIST, 1890, I have given a classification of the Testudinata, distinguishing four sub-orders—*Amphichelydia, Pleurodira, Cryptodira, Trionychia.*

To-day I shall give a more detailed classification of the living forms of the Testudinata belonging to the Cryptodira.

CRYPTODIRA.

No free nasals, a parieto-squamosal arch present or absent; descending processes of prefrontals connected with vomer; stapes in an open groove, of the quadrate or covered by the quadrate behind; pterygoids narrow in the middle, without wing-like lateral expansions, separating

[4]Bull. U. S. Fish Comm. 1892, p. 51, 1893.

[5]Proc. Phila. Acad. 1892, p. 331.

[6]Bull. Mus. Comp. Zoology xxiv, no. 2, 1893.

quadrate and basisphenoid; epipterygoid free or not free; dentary bones united. Cervical vertebræ with rudimentary transverse processes in front of vertebra; the posterior cervicals with double articular faces; sacral ribs well-developed and connected with centrum and neuroids. Pelvis free from plastron and carapace. Epiplastra in contact with hyoplastra; entoplastron oval, rhomboidal or T-shaped, a more or less complete series of peripheralia more or less connected with the ribs.

I.—CHELONIOIDEA.

A parieto-squamosal arch; no foramen palatinum between palate and maxillary; articular faces between the sixth and seventh cervical plane; nuchal with a distinct process on the lower side for the articulation with the neuroid of the eighth cervical; no lateral processes of nuchal. One biconvex cervical vertebra.

1. *Cheloniidæ.*

Skull with descending processes of parietals; limbs paddle-shaped; claws one or two. *Chelonia, Thalassochelys, Caretta, Lepidochelys.*

2. *Dermochelyidæ.*

Skull without descending processes of parietals; limbs paddle-shaped; no claws. Bony carapace dissolved into numerous mosaic-like pieces. *Dermochelys.*

II.—CHELYDROIDEA.

No parieto-squamosal arch; a foramen palatinum between palate and maxillary; articular faces between the sixth and seventh cervicals not plane; nuchal without lower process, but with more or less strong lateral process underlying the peripherals; one biconvex cervical; a complete series of inframarginals.[1]

1. *Dermatemydidæ.*

Frontals not excluded from orbit; maxillary without connection with quadratojugal; squamosal without connection with postfronto-orbital; mesogastroid well-developed, separating completely entopubes and entoischia; number of peripherals 11; an entoplastron. Number of neuralia incomplete; the posterior pleurals not meeting in median line. *Dermatemys.*

2. *Chelydridæ.*

Frontals excluded from orbit; maxillary without connection with quadratojugal; squamosal in connection with postfronto-orbital; meso-

[1] Some species of *Kinosternon* excepted.

gastroid well-developed, separating completely entopubes and entoischia; number of peripherals 11; an entoplastron. Number of neuralia complete; posterior pleurals meeting in median line. *Chelydra, Macrochelys.*

3. *Staurotypidæ.*

Frontals excluded from orbit; maxillary in connection with quadratojugal; squamosal without connection with postfronto-orbital; mesogastroid well-developed, separating completely entopubes and entoischia; number of peripherals 10; an entoplastron; number of neuralia incomplete; posterior pleurals meeting on median line. *Staurotypus, Claudius.*[1]

4. *Kinosternidæ.*

Frontals excluded from orbit; maxillary in connection with quadratojugal; squamosal without connection with postfronto-orbital; mesogastroid reduced; number of peripherals 10; no entoplastron; number of neuralia incomplete; posterior pleurals meeting on median line. *Kinosternon, Aromochelys, Goniochelys.*

III.—PLATYSTERNOIDEA.

No parieto-squamosal arch; a foramen palatinum between palate and maxillary; articular faces between sixth and seventh cervical not plane; nuchal without lower and without a lateral process; two biconvex cervicals; a complete series of inframarginals. Skull of the type of the Chelydroideae.

Platysternidæ.

Frontals excluded from orbit; maxillary in connection with quadratojugal; jugal excluded from orbit; squamosal connected with postfronto-orbital; mesogastroid well-developed, separating completely entopubes and entoischia; number of peripherals 11; an entoplastron; number of neuralia complete. *Platysternum.*

[1] In *Claudius* the post-orbital arch is exceedingly slender; the parietal sends down a process behind the postfronto orbital to join the jugal. The zygomatic arch is also very slender, but three times as broad as the postorbital; the interorbital arch is one and a half times the diameter of the orbit. The lower jaw is strongly hooked, with the symphysis larger than the diameter of orbit. Upper jaw with a small but distinct hook, each maxillary with a very sharp lateral hook. Lower side of skull as in Kinosternon; palate not forming a part of the alveolar surface, the posterior nares not bridged over by palate and vomer as in Staurotypus. Pterygoids without any ectopterygoid process.

IV.—TESTUDINOIDEA.

No parietosquamosal arch; a foramen palatinum between palate and maxillary; articular faces between sixth and seventh cervical not plane; nuchal without lower process; two biconvex cervicals; an incomplete series of inframarginals; squamosal not connected with postfronto-orbital.

Emydidæ.

Quadrate open behind; number of phalanges of second and third toe of hind foot more than two; peripherals of bridge without median processes interlocking with rib-ends; rib-ends in a groove of the peripherals.

Testudinidæ.

Quadrate closed behind; number of phalanges of second and third toe of hind foot never more than two; peripherals of bridge with median processes interlocking with rib-ends.

—G. BAUR, *University of Chicago.*

Two New Species of North American Testudinata.—The following species of Graptemys have been described:

1. *Graptemys geographica*, Les. 1817.
2. *Graptemys pseudogeographica* (Les. MSS.), Holbrook, 1842.
3. *Graptemys oculifera*, Baur, 1890. Science, No. 405, pp. 262–263.
4. *Graptemys kohnii*, Baur, 1890. l. c.

GRAPTEMYS PULCHRA spec. nov.

For some years I have been acquainted with two specimens of a *Graptemys* preserved at the Smithsonian Institution. Both specimens were collected by Dr. T. H. Bean in Montgomery, Ala., and bear the number 8808. One of these is mentioned in Yarrow's Catalogue (Bull. U. S. Nat. Mus., No. 24, 1883), as "*Malacoclemmys geographicus.*" In 1891 I received a skull and a very large living specimen from Mr. G. Kohn, of New Orleans, La., of the same species.

The coloration of the skull and neck distinguishes this species at once from all the others. The whole space between and behind the orbits is characterized by a continuous yellow figure, which sends backward on each side behind each orbit a strong process of the same color.

The head resembles that of *Graptemys kohnii*, but is more slender. The symphysis of the lower jaw is longer and the nose projecting. In all the skulls examined the jugal is excluded from the orbit, a charac-

ter not seen in the other species of *Graptemys* or *Malaclemmys*. The form of the carapace is very close to *Graptemys kohnii;* the dermal shields are very thin. It is the largest form of *Graptemys*, the shell reaching a length of over 170 mm. in straight line. The color of the shell is light olive with yellow marks on the marginals, the plastron is yellow, with some darker marks. Types: No. 8808. Smithsonian Institution, Washington, D. C. Two not full-grown specimens, collected by Dr. T. H. Bean at Montgomery, Ala.

The genus *Malaclemys*, with the single species *M. centrata* (Bosc. MSS.) Latreille, 1801, is distinguished from *Graptemys* by the lower jaw, which is pointed and not rounded in front, and also by the condition of the quadratojugal and maxillary. In *Malaclemys* the quadratojugal is extensively united with the maxillary; in *Graptemys* these elements are separated by the quadratojugal. The peculiar character of the jugal in *Graptemys pulchra* may perhaps justify the creation of a new genus for this species. I have given to the common "Diamond-back" the name *Malaclemmys centrata* (Bosc. MSS.) Latreille, 1801. The name *M. terrapin* Schoepff, 1793, cannot be used. The same name (*Testudo terrapen*) was given by Bonnaterre in 1789 to the *Trachemys rugosa* Shaw, 1802, of Jamaica. Already in the year 1788, however, Gmelin introduced the name *Testudo palustris* for the Jamaica tortoise; I therefore use the name *Trachemys palustris* Gmelin for the Jamaica tortoise, and that of *Malaclemmys centrata* (Bosc. MSS.) Latreille for the "Diamond-back."

KINOSTERNON LOUISIANÆ spec. nov.

Shell much like *K. pensilvanicum*, but more elongated. Skull different; the lateral hook in the middle of the maxillary very much developed and very sharp; median hook on symphysis not so strong; postorbital arch stronger than in *K. pensilvanicum*. Lower jaw very strong, ending in a sharp point; symphysis of lower jaw larger than vertical diameter of orbit. A yellow-orange stripe from snout over upper part of orbit along neck, one from the angle of the mouth. Four barbels, two just behind the symphysis near together and two farther behind more separated. Limbs and neck olive gray; a few yellow spots on top of the posterior part of head; webs more developed than in *K. pensilvanicum*. Lower jaw with greyish-yellow dots and lines. The whole coloration is very much like that in *Aromochelys tristycha* Ag., which is found together with *K. louisianæ*. seen from above these two animals resemble each other very much. They belong to different genera, but have about the same specific characters.

I have received many specimens of this species through the kindness of Mr. Gustave Kohn, of New Orleans, La. This species is the representative of *K. pensilvanicum* in Louisiana. I have never received a specimen of *K. pensilvanicum* from this locality, and believe that all the specimens which have been described as *K. pensilvanicum* from this State belong to *K. louisianæ*. Type specimen, No. 15527, Smithsonian Institution, from New Orleans, La.

—G. BAUR, *University of Chicago.*

Further Notes on American Box-Tortoises.—In Science, of April 3, 1891 (Vol. XVII, No. 426), I have given the osteological characters of three of the American Box-Tortoises: *Terrapene major* Ag., *T. carolina* L., and *T. ornata* Ag.

Through the kindness of Mr. Gustave Kohn, of New Orleans, La., I have received lately three living specimens of *T. triunguis* Ag. (*C. cinosternoides* Gray, Boul.) Besides I have received a specimen of *T. mexicana* Gray, for which I have to thank Dr. A. L. Herrera, Director of the National Museum, Mexico. Both these forms proved to be very interesting. I give now osteological characters of all the forms of Terrapene.

TERRAPENE MAJOR AG., 1857.

Quadratojugal well-developed, forming a complete zygomatic arch; cervicals long; upper branch of scapula considerably longer than inner branch (endo-scapula); digits with well-developed webs.

Number of phalanges in fore-foot, 2 3 3 3 2; in hind foot, 2 3 3 3 2.

Southern States. Locality of type, Mobile, Ala.

TERRAPENE CAROLINA L., 1766.

Quadratojugal rudimentary, only connected with quadrate; cervicals shorter than in *T. major* Ag.; upper branch of scapula somewhat longer than inner branch (endo-scapula), but not so long as in *T. major*; digits slightly webbed.

Number of phalanges in fore-foot, 2 3 3 3 2 or 2 3 3 2 2; in hind foot 2 3 3 3 2.

Eastern States to Indiana.

TERRAPENE MEXICANA GRAY, 1849 (*Onychotria*).

Quadratojugal rudimentary, only connected with quadrate; cervicals probably as in *T. major;* upper branch of scapula as in *T. major*. No web between the digits and only three claws in the hind foot.

Number of phalanges in fore-foot, 2 3 3 2 2; in hind foot, 2 3 3 3 1.

Mexico.

This species is readily distinct from *T. triunguis* by its oval tectiform carapace. *The additional vertebral shield between the fourth and fifth, seen in both the British Museum specimens, is present also in the specimen received from Dr. Herrera.*

TERRAPENE TRIUNGUIS AG., 1857.

Syn. *Emys kinosternoides* Gray.

Quadratojugal rudimentary, only connected with quadrate; cervicals somewhat shorter than in *T. major;* scapula as in *T. major;* no web between the digits, and only three claws in the hind foot. Shell as in *T. carolina* L.

Number of phalanges in fore-foot, 2 3 3 2 2 or 2 3 3 2 1; in hind foot, 2 3 3 2 1.

Louisiana, Arkansas, Indian Territory, Mississippi, Georgia.

TERRAPENE ORNATA AG., 1857.

Quadratojugal absent; cervicals very short; upper branch of scapula of the same length as inner branch (endo-scapula); digits without distinct web.

Number of phalanges of fore-limb, 2 2 2 2 2; of hind limb, 2 3 3 3 1.

Central States. Type from Upper Missouri, Iowa.

—G. BAUR, *University of Chicago.*

ENTOMOLOGY.[1]

Spiders collected in New Mexico and Arizona.—Among some spiders sent to Professor G. W. Peckham, of Milwaukee, a year or two ago, the following species of Attidæ was found.

Habrocestum hirsutum Peckham. This species was originally described from Oregon. The specimens sent were collected at Las Cruces, New Mexico.

Professor Peckham wrote that there were several other species of Attidæ in the sending, but that they were immature and could not be determined.

Some spiders sent to Dr. Geo. Marx, about the same time, were identified by him as follows. They were all collected at Las Cruces.

Pholcus n. sp. A very interesting one.

Lathrodectus n. sp.

Filistata capitata Hentz.

Ocyale n. sp.

Misumena rosea Keys.

Scytodes thoracica Latr.

Hamataliva grisea Keys.

Loxosceles unicolor Keys.

Dictyna sedentaria Keys.

Dr. Marx wrote that the last five species were of much interest, and mostly very rare.

Recently a lot of spiders was sent to Mr. Nathan Banks, including all that had been collected since the above sendings, both in New Mexico and Arizona. He has reported on them as follows.

The following are from north-eastern Arizona:

Tetragnatha laboriosa Hentz. ♂ and ♀.

Steatoda corollata Linn. ♀.

Misumena vatia Clerck. ♀ and young.

Olios giganteus Keys. Young.

Pardosa n. sp. ♀.

Phidippus sp.? Young ♀. Mr. Banks writes that "this is probably *arizonensis* Peck., but the ♀ has not been described."

Dendryphantes retarius Hentz. ♀.

Dendryphantes octavus Hentz. ♂ and ♀.

[1] Edited by Dr. C. M. Weed, New Hampshire College, Hanover, N. H.

Dendryphantes sp. prob. new. ♀. Mr. Banks writes that "this is near *octavus* Hentz, and may be only a variety, but cannot decide without the ♂."

Eris barbipes Peck. Mr. Banks writes that this species "has not been recorded from the United States. It was described from Mexico."

The following are from southern New Mexico, mostly near Las Cruces:

Thanatus coloradensis Keys. ♂ and ♀.
Lathrodectus mactans Koch. Young.
Steatoda corollata Linn. ♂ and Young.
Pholcus n. sp. ♂ and young.
Filistata capitata Hentz. ♂.
Epeira trivittata Keys. ♂ and ♀.
Trochosa sp.? Young.
Marptusa californica Peck. Young.
Astia sp.? Young.
Eurypelma steindachneri Auss. ♂.
Ariope riparia Hentz. ♀.
Lycosa n. sp. ♂. This specimen was collected in the Organ Mountains. It is in all probability the same as the common form here, which is called the "tarantula."

A solpugid, found in southern New Mexico, was also included in the sending to Mr. Banks, and was determined by him as *Datames pallipes* Say.

Mr. Banks, in conclusion, writes as follows concerning this fauna: "Your fauna seems to have a Colorado tinge, with forms from California and the Gulf States. A number of the species run across from Texas to southern California."

The above list makes a showing of twenty-five species of Araneina from the south-western region, which, though small, is a material contribution to the knowledge of this fauna.—C. H. Tyler Townsend.

Lepidopterous gall on Bigelovia.—On June 21, 1892, elongate flower-bud like galls were found on *Bigelovia graveolens*, near Galls Spring, New Mexico. Several which were opened on that date showed within what appear to be lepidopterous larvæ. The latter were reddish in color, somewhat the color of codling moth larvæ. More galls were found, June 22, west of Apache Spring, New Mexico. One of these which was opened showed two very small larvæ within.

Gall. Length 19 mm.; greatest width, 5 mm. Resembling an elongate flower-bud in shape and appearance, elongate pyriform with a

stem-like portion about as long as the body of the gall, the whole appearing to be formed of a widened leaf or large stipule of the plant with the edges meeting and grown together, forming an elongate cavity inside, the basal stem portion narrow and more or less cylindrical, gradually thickening at body which is swollen. Stem clothed with fine white wooly fibers on the outside, the body light greenish and not so thickly wooly. Several narrowed and elongate leaves of the plant are grown to the outside of the body, springing from the stem and running longitudinally to tip of gall. These apparently reveal the mode of formation of the gall, which is, if I am not mistaken, formed of a number of the elongate leaves of the plant grown together, the edge of one to the edge of the next. The stem portion is not hollow but solid. The larvæ live in the hollow body of the gall.

Described from one specimen. The larva which was found within this gall shows no traces of thoracic or other legs, but possesses a large and distinct head with strong jaws. I infer that it is lepidopterous.—C. H. Tyler Townsend.

North American Locusts.—Mr. Lawrence Bruner publishes[2] a valuable paper on "The More Destructive Locusts of America North of Mexico." A considerable number of species are treated of, full descriptions being given together with notes on preventive measures. Many new illustrations appear, four of which are reproduced on the accompanying plate, where *a* represents *Acridium frontalis* from Kansas; *b. Dendrottetix longipennis*, the "Post-oak Locust" of Texas *c. Melanoplus robustus* also of Texas; and *d*, the large green Bush-locust (*Acridium shoshone*) which occurs in many of the Southwestern States.

Entomological Notes.—The sixteenth of the admirable series of Reports of Observations of Injurious Insects by Miss Eleanor A. Ormerod of England has recently appeared. Its most distinctive feature in the way of illustrations consists of a number of plates, from photographs, of injuries to turnips and cabbages caused by eel-worms and slime fungi.

Mr. H. F. Wickham is spending the summer collecting insects and other specimens in the region of the West Indies. He is with a party from the Iowa State University.

Dr. A. S. Packard has recently published two important papers on Heterocera. One deals with "The life-histories of certain moths of the

[2] U. S. Dept. Ag., Div. Ent. Bull., No. 28.

family Cochliopodidæ, with notes on their spines and tubercles"[3] and the other records the author's "Studies on the transformations of Moths of the family Saturniidæ[4]". In both papers the armature of the caterpillars is carefully described, and many figures are given.

Professor C. H. T. Townsend formerly of the New Mexico Agricultural College announces that after June 1, 1893 his address will be: C. H. Tyler Townsend, Curator of Museum, Institute of Jamaica, Kingston, West Indies.

Mr. James Fletcher has favored us with a copy of his "Evidence before the standing Committee of the House of Commons on Agriculture and Colonization" for the session of 1892. It is a careful discussion of the economic value of entomological study.

PROCEEDINGS OF SCIENTIFIC SOCIETIES.

Boston Society of Natural History.—May 17.—The following paper was read: Dr. Clarence J. Blake—Out of Darkness into Light; or The Education of a Blind Deaf-Mute.

—SAMUEL HENSHAW, *Secretary.*

The Biological Society of Washington.—May 20.—The following communications were read: Dr. V. A. Moore—The Distribution of Pathogenic Bacteria in the Upper Air Passages of Domesticated Animals; Professor C. V. Riley—Some Further Notes on Yucca Pollination; Professor B. W. Evermann—The Ichthyologic Features of the Black Hills; Dr. W. H. Dall—New Forms of Fossils from the Old Miocene of the Gulf States; Dr. C. Hart Merriam—Biology in our Colleges; Dr. C. Hart Merriam—Facts of General Biological Interest Resulting from a Study of the Kangaroo Rats.

FREDERICK V. COVILLE, *Secretary.*

Anthropological Society of Washington.—May 9.—The following papers were read: Common Errors in Regard to Indian Language, Mr. J. N. B. Hewitt; Primitive Belief in a Future State: a Comparative Study, Mr. H. E. Warner; The Pivot Point in Modern History: Andrew Palaeologus at Barcelona, Col. F. A. Seely; Fourth Centenary of the Discovery of America, at Madrid, 1892, Dr. Thomas Wilson.—WESTON FLINT, *Secretary.*

[3] Proc. Amer. Philos. Soc. v. XXXI, pp. 83–108.

[4] Proc. Am. Acad. Arts and Sciences, 1893, pp. 55–92.

The Agassiz Scientific Society of Oregon met Wednesday, May 10, at 8 P. M., in the Botanical Laboratory of the Agricultural College. The principal paper of the evening was by Professor Dumont Lotz on "Food Adulterants."—F. L. WASHBURN, *Sec.*

SCIENTIFIC NEWS.

—THE entire Leidy collection of Parasites, property of the Biological Department, University of Pennsylvania, has been placed in the hands of Dr. C. W. Stiles for revision. Dr. Stiles intends to publish a descriptive catalogue of this collection, together with a descriptive catalogue of eight other collections now in his possession.

—THE Smithsonian Institution has taken an American table at the Naples Station for three years. Dr. Stiles will publish the correspondence between Secretary Langley and himself relating to the table, in the form of a report to the signers of the memorial presented to the Institution, in a later number of the NATURALIST.

THE next meeting of the Australian Association for the Advancement of Science will be held in Adelaide, South Australia, commencing on September 25, 1893.

The Association has now been in existence since 1888. Four meetings have been held, viz:—

In September, 1888, at Sydney—President, H. C. Russell, C. M. G., B. A., F. R. S., Government Astronomer, N. S. W.

In January, 1890, at Melbourne—President, Baron F. von Mueller, K. C. M. G., Ph.D., F. R. S.

In January, 1891, at Christchurch—President, Sir James Hector, K. C. M. G., M. D., M. D., F. R. S.

In January, 1892, Hobart—President, His Excellency, Sir Robert Hamilton, K. C. B.

The meeting in Adelaide will be presided over by Ralph Tate, F. L. S., F. G. S., Professor of Natural Science at the University of Adelaide.

Since its commencement the Association has grown steadily, and now numbers about 900 members. The work is divided into sections as in the British Association, whose rules on most points have been closely followed.

The meeting of next year will last about a week, during which time the Sections will meet daily for the reading and discussion of papers. During the week there will be various short excursions to places of interest, and some evening entertainments. After the meeting one or two longer excursions will be arranged.

At the time fixed for the meeting, South Australia will be at its best. There is no better time at which to visit Australia than when spring is merging into summer. To naturalists, this time of year is specially attractive, and these may be reminded that at the meeting of the Association they will come into contact with men of like tastes from all parts of Australia.

Should visitors wish to prolong their trip, they will do well to visit during the months of October and November the principal objects of interest in the mainland, and in December, January and February to pass on to New Zealand and Tasmania.

Table of Contents of the North American Review for June, 1893.—THE LESSON OF THE NAVAL REVIEW, by the Hon. Hilary A. Herbert, Secretary of the Navy; Who are the Greatest Wealth-Producers? W. H. Mallock; How to Check Testamentary Litigation, Surrogate Ransom, of New York; Disappearing Dickensland, Charles Dickens; A Look Ahead, by Andrew Carnegie; Police Protection at the World's Fair: I. By the General Superintendent of the Chicago Police—II. By the Chief of the Secret Service, World's Columbian Exposition; Thirty Knots an Hour to Europe, Professor J. H. Biles, Designer of the "Paris" and the "New York:" Reform of the Drink Traffic, the Rev. W. S. Rainsford, D. D.; The Financial Outlook, by the Hon. W. Bourke Cockran. *Notes and Comments.*—Christ as an Orator, T. Alexander Hyde. A Farmer's View of Free Coinage, Newton F. Bunnell; The Art of Living Two Hundred Years, William Kinnear; Inebriety from a Medical Standpoint, Dr. E. F. Arnold.